



REPORT OF THE  
**Hydro-Electric Power  
Commission**  
OF ONTARIO  
**1918**  
VOL. I.

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-A55

WILLS MACLACHLAN, Esq.



*Wills MacLachlan*



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Birdseye view of Niagara Falls



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Ontario Hydro-Electric  
Power Commission

(Eleventh) Annual Report

OF THE

HYDRO-ELECTRIC POWER  
COMMISSION

OF THE

PROVINCE OF ONTARIO

FOR THE YEAR ENDED OCTOBER 31st

1918

VOLUME I

PRINTED BY ORDER OF  
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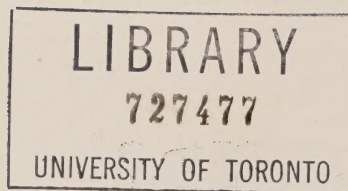


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*To His Honour, COLONEL SIR JOHN HENDRIE, K.C.M.G., C.V.O.,*

*Lieutenant-Governor of Ontario.*


MAY IT PLEASE YOUR HONOUR:

The undersigned has the honour to present to Your Honour the Eleventh Annual Report of the Hydro-Electric Power Commission of Ontario for the fiscal year ending October 31st, 1918.

Respectfully submitted,

ADAM BECK,

*Chairman.*



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TORONTO, ONT., February 25th, 1919.

COLONEL SIR ADAM BECK, K.B., LL.D.,

*Chairman, Hydro-Electric Power Commission of Ontario,  
Toronto, Ont.*

SIR,—I have the honour to transmit herewith the Eleventh Annual Report of the Hydro-Electric Power Commission of Ontario for the fiscal year ending October 31st, 1918.

I have the honour to be,

Sir,

Your obedient servant,

W. W. POPE,

*Secretary.*





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ELEVENTH ANNUAL REPORT  
OF THE  
Hydro-Electric Power Commission  
of Ontario

SECTION I  
LEGAL PROCEEDINGS

ACTS

February 12th, 1919.

The following Act to amend the Power Commission Act and confirm certain By-laws and Contracts was passed by the Legislature of the Province of Ontario during the Session of 1918.

An Act to amend The Power Commission Act.

**H**IS MAJESTY, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:

1. This Act may be cited as *The Power Commission Act, 1918*. Short title.
2. Subsection 2 of section 6 of *The Power Commission Act* as amended by section 2 of *The Power Commission Act, 1916*, is amended by striking out the word "persons" and inserting in lieu thereof the words "chief engineer, accountant, and secretary." Rev. Stat.,  
c. 39, s. 6,  
ss. 2,  
amended.  
Payment of  
salaries.
3. Section 6a of *The Power Commission Act* as amended by section 4 of *The Power Commission Act, 1916*, and section 2 of *The Power Commission Act, 1917*, is amended as follows: Rev. Stat.,  
c. 39, s. 6a,  
6 Geo. V,  
c. 19, s. 4;  
7 Geo. V,  
c. 20, s. 2,  
amended.
  - (a) Subsection 3 is amended by striking out the words "through the comptroller" in the first line thereof; Ib, ss. 3,  
amended.
  - (b) Subsection 3, clause a is amended by striking out the word "December" and substituting therefor the word "October"; Ib, ss. 3,  
cl. a,  
amended.
  - (c) Subsection 3, clause b is repealed and the following substituted therefor: Ib, ss. 3,  
cl. b,  
repealed.
    - (b) Statement of the capital costs of each system operated by the Commission with capital investments of a non-operating character comprised in the same; Cost  
statement.

Ib. ss. 3.  
cl. c,  
repealed.

(d) Subsection 3, clause c is repealed;

Ib. ss. 3,  
cl. d,  
repealed.

(e) Subsection 3, clause d is repealed and the following substituted therefor:

Statement  
of opera-  
tions of  
each  
system.

(d) Statement with respect to each system or works operated or controlled by the Commission showing the accumulated—

1. Operating surplus or deficit (excluding charges for sinking fund payments and reserves for renewals) of,

2. Charges made for reserves or renewals against,

3. Charges made for sinking fund requirements to

each municipality comprised in such system and the total accumulated surplus or deficit of each such municipality on October 31st in each year, also the date when sinking fund payments were first made by it.

Ib. ss. 3,  
cl. e,  
repealed.

(f) Subsection 3, clause e is repealed and the following substituted therefor:

Profits on  
earnings  
from other  
than muni-  
cipal cor-  
porations.

(e) Amount of profits earned by each system from sale of power to other than municipal corporations, showing the amount of such profit distributed amongst municipalities and the amount otherwise disposed of;

Ib. ss. 3,  
cl. f,  
repealed.

(g) Subsection 3, clause f is repealed and the following substituted therefor:

Statement  
of indebted-  
ness to  
Commis-  
sion.

(f) Statement of amounts of the indebtedness due or owing by municipal or other corporations or persons to the Commission in respect of—

1. Construction of works undertaken and for services rendered,

2. Power bills,

3. Sale of electrical equipment, apparatus or supplies,

4. Debts of other nature, if any, where such debts are three months or more overdue.

Ib. ss. 6,  
amended.

(h) Subsection 6 is amended by adding at the end thereof the words "named in the direction of the Lieutenant-Governor in Council";

- (i) Subsection 7 is amended by striking out the words "out of such moneys as may be appropriated for the purposes of the Commission by the Legislature, as part of the costs of the administration" and substituting therefor the words "by the Commission as part of the costs of administration of the Commission."

4. *The Power Commission Act* is amended by adding thereto the following sections: Rev. Stat.  
c. 39,  
amended.

- 6b. All special funds and the income and revenue thereof and all moneys and revenues which now are in or shall come into the hands of the Commission whether as agent, trustee, owner or otherwise shall form one fund to be called "General Fund" and the Commission shall have power from time to time to make any and all expenditures out of the said fund for the purposes and objects of the Commission without regard to the special trusts or purposes under which the same or any part thereof may come to its hands; and the Commission shall account for and from time to time pay out of the said funds all moneys for which it shall be so accountable; "General  
Fund" con-  
tributed.

- 6c. The Commission may retain and set apart out of the moneys coming into its hands from time to time such sums as may in the opinion of the Commission be sufficient,— Reserve  
funds.

1. To provide for the renewal, reconstruction, alteration and repair of the works constructed and operated by the Commission;
2. To meet interest upon working capital and for the operation of the Commission under section 21 of this Act, and to met obligations, charges, and expenses arising from time to time in the course of such operations;
3. And to meet any unforeseen expenditures or costs caused by the destruction or injury to any of the works of the Commission or otherwise incurred or payable by the Commission.

- 6d. Any surplus or part thereof in the hands of the Commission from any municipality may be retained by the Commission as security against future obligations to the Commission of the same municipality for so long during the continuance of the contract of the municipality as the Commission may think fit but the Commission shall allow to the municipality interest at the rate of four per centum per annum upon the amount of such surplus from time to time retained by the Commission; Surplus  
funds,—  
application  
of.



Investment  
of funds  
in Govern-  
ment  
securities.

6e. The Commission may, at its discretion, invest any funds other than sinking funds not required in carrying out the objects of the Commission in the debentures or other securities of the Dominion of Canada or of the Province of Ontario.

Rev. Stat.,  
c. 39, s. 8,  
amended.

5. Section 8 of *The Power Commission Act* is amended by adding the following clause,—

Leasing  
or operating  
works of  
others.

(gg) lease or operate the works for the generation, transmission, distribution or use of electrical energy of any person, firm or corporation on such terms as the Commission may arrange with the owner.

Rev. Stat.,  
c. 39,  
amended.

6. *The Power Commission Act* is amended by adding thereto the following sections:

Guarantee  
by pro-  
vince of  
advances  
from  
banks, etc.

14e. The Lieutenant-Governor in Council may guarantee the repayment of advances made by banks or any other indebtedness incurred by the Commission, and any Order in Council heretofore passed stating that the Government of Ontario does guarantee the repayment of any such advances or indebtedness, shall be legal and valid, and be binding upon the the Province of Ontario.

General  
borrowing  
powers.

14f. Subject to the approval of the Lieutenant-Governor in Council, the Commission may borrow money from time to time for the purposes of the Commission and issue bonds, debentures, and other securities of the Commission therefor.

Rev. Stat.,  
c. 39, s. 15,  
ss. 1,  
repealed.

7. Subsection 1 of section 15 of *The Power Commission Act* is repealed and the following substituted therefor:

Applica-  
tion of  
moneys re-  
ceived to  
sinking  
fund  
account.

(1) All sums received by the Commission from municipal corporations and others on sinking fund account shall be vested by the Commission in securities of the Province of Ontario, and also all interest accruing thereon; and such securities shall be delivered by the Commission to the Treasurer of Ontario as security for repayment of the advances made by the Province to the Commission;

Interest on  
advances by  
Province.

(1a) The Commission shall pay to the Treasurer of Ontario annually interest on the indebtedness of the Commission to the Province for moneys advanced to the Commission by the Province as may be from time to time determined by the Lieutenant-Governor in Council as sufficient to reimburse the Province the full amount of interest paid by the Government on moneys raised for the purposes of the Commission and the charges incurred by it in providing such money.

6 Geo. V.  
c. 19, s. 8,  
amended.

8.—(1) Subsection 1 of section 15a of *The Power Commission Act*, as enacted by section 3 of *The Power Commission Act, 1916*, is amended

by adding at the end thereof the words "and to other persons, firms and corporations." Supplies to municipal corporations and others.

(2) The said section 15a is amended by adding thereto the following 6 Geo. V, c. 19, s. 8, amended.  
as subsection 1a:

1a. The Lieutenant-Governor in Council from time to time upon the request of the Commission specifying Manufacturing and dealing in supplies.

(a) the nature and volume of the business to be carried on; and

(b) the extent of the liability which may be incurred in connection therewith;

may authorize the Commission within the Province of Ontario to manufacture such electrical, hydraulic, or other machinery, appliances, apparatus, and furnishings as may be used in the development, transmission, distribution, supply or use of electrical power, and to acquire patents of invention, or interests in patents of invention, and to sell and dispose of such machinery, appliances, furnishings or patent rights, and the profits and losses arising from such operation shall be adjusted and apportioned among the municipalities having contracts with the Commission, or be otherwise applied as the Commission shall see fit.

**9.** *The Power Commission Act* is amended by adding thereto the following sections: Rev. Stat., c. 39, amended.

15b.—(1) The Commission may purchase, lease or otherwise acquire lands, by expropriation or otherwise, necessary or required by the Commission for office, service, or other buildings and erect thereon such office and other buildings and equipment and appliances as the Commission may think fit for the purposes of the Commission; Office buildings, etc.

(2) The purchase of all lands or leaseholds heretofore acquired by the Commission and the expenditure of the Commission in the erection of office and other buildings, equipment and appliances thereon, heretofore made by the Commission for the purposes aforesaid, are hereby confirmed; Purchases, etc., heretofore made validated.

(3) The expenditure of the Commission in the purchase or lease of the said lands and the erection of the said buildings together with such additions and extensions of the same as may be found necessary from time to time shall be repayable to the Commission by the municipal corporations which have entered into contracts with the Commission by annual sums sufficient to form in thirty years a sinking fund for the repayment of the cost thereof. Apportionment of expenditures.

Rev. Stat.,  
c. 39, s. 22,  
repealed.

**10.** Section 22 of *The Power Commission Act* is repealed and the following substituted therefor:

Repayment  
of expendi-  
tures on  
behalf of  
muni-  
cipalities.

22. The expenditure of the Commission upon any works undertaken under the provisions of this Act for the benefit of any municipality or municipalities which have entered into contracts with the Commission shall be repayable to the Commission by such municipality or municipalities.

Rev. Stat.,  
c. 39, s. 3,  
amended.  
Annual  
charge to  
muni-  
cipalities.

**11.** Section 23 of *The Power Commission Act* as amended by section 4 of *The Power Commission Act, 1914*, and section 11 of *The Power Commission Act, 1915*, is amended as follows:

The clause lettered *a*:

Interest.

By adding after the words "works" in the last line thereof the words "and upon all such other expenditures as the Commission may make under the powers conferred upon the Commission under this Act and upon working capital,"—and

The clause lettered *b*:

Sinking  
fund  
charges.

By inserting after the word "in thirty years" in the second line thereof, the words "with interest at four per cent. per annum" and by striking out the words "retirement of the securities issued" in the third line thereof and substituting the words "repayment of the advances made."

The clause lettered *c*:

Advances  
for  
working  
capital.

By inserting after the words "capital account" in the 16th line thereof the words "advances for working capital."

Rev. Stat.,  
c. 39,  
amended.

**12.** *The Power Commission Act* is amended by adding thereto the following section:

Extending  
time for  
payments  
by muni-  
cipalities.

(23) *a.* The Commission may from time to time during the first three years after any municipality shall first begin to take power from the Commission extend the time for payment of the sums payable by any municipality or any part thereof, and such municipality shall pay to the Commission interest on the amount which may be in arrear or for the payment for which time is extended until the payment thereof, at such rate not exceeding seven per cent. per annum as the Commission may determine.

Rev. Stat.,  
c. 39,  
amended.

**13.** *The Power Commission Act* is amended by adding thereto the following sections:

What to  
be deemed  
a system.

23*b.* Where by their contracts with the Commission a number of municipalities have assumed the costs of the purchase of, or



works for the development of, electrical energy for the supply of such group of municipalities, under the provisions of this Act, such group of municipalities shall, for the purpose of this Act be defined as a "system."

23c. The Power Commission shall have the right wherever physical connections may be made between any of the systems operating under this Act to make the necessary connections so as to divert power from any one system to any other system, and the means of such connection, and the price to be paid by the system receiving such power to the system supplying such power shall in all cases be determined by the Commission, and the cost of the power so taken by any one system from any other shall be dealt with by the Commission under the provisions of the Act as the cost or part of the cost of the power to be paid by the municipalities forming part of such system under their contracts with the Commission;

Supplying power from one system to another.

23d. The price payable for power by one system to another shall be collected by the Commission from the system owing the same to the system entitled to receive the same, and all sums so paid to any system shall be applied to the cost of construction, maintenance and operation of such system in such manner as the Commission may direct.

Adjustment between systems.

14. Section 24 of *The Power Commission Act* is amended by adding thereto the following subsections:

Rev. Stat., c. 39, s. 24, amended.

(2) The Commission shall also annually adjust and apportion among the municipalities all such expenditures made by the Commission in exercise of the powers conferred upon the Commission by this Act as have been incurred for on behalf of the municipalities.

Annual adjustment of expenditures for municipalities.

(3) The adjustment and apportionment made by the Commission shall be final and binding upon the municipal corporation.

Adjustment to be final.

15. Section 37 of *The Power Commission Act*, as enacted by section 10 of *The Power Commission Act, 1916*, is amended by adding thereto the following subsection:

Rev. Stat., c. 39, s. 37, amended. 6 Geo. V, c. 19.

11. This section shall not apply to any mine as defined in *The Mining Act of Ontario*, save only as regards any dwelling-house or other building not connected with or required for mining operations or purposes or used for the treatment of ore or mineral.

16. By-law No. 301 of the Corporation of the City of Chatham; By-law No. 1815 of the Corporation of the City of Fort William; By-laws Nos. 1462 and 4380 of the Corporation of the City of Port Arthur;

By-laws confirmed.

By-laws Nos. 895 and 896 of the Corporation of the Town of Aylmer; By-laws Nos. 322 and 323 of the Corporation of the Town of Alliston; By-laws Nos. 175 and 242 of the Corporation of the Town of Hanover; By-law No. 1261 of the Corporation of the Town of Perth; By-law No. 265 of the Corporation of the Town of Picton; By-law No. 588 of the Corporation of the Town of Parkhill; By-law No. 1301 of the Corporation of the Town of Smith's Falls; By-laws Nos. 358 and 359 of the Corporation of the Village of Beeton; By-law No. 265 of the Corporation of the Village of Bloomfield; By-laws Nos. 408 and 444 of the Corporation of the Village of Bradford; By-law No. 21 of the Corporation of the Village of Cookstown; By-law No. 316 of the Corporation of the Village of Drayton; By-law No. 10 of the Corporation of the Village of Oil Springs; By-law No. 258 of the Corporation of the Village of Tottenham; By-law No. 265 of the Corporation of the Village of Wellington; By-law No. 28 of the Police Village of Brigden; By-law No. 712 of the Police Village of Moorefield; By-laws Nos. 439 and 440 of the Police Village of Omemee; By-law No. 440 is amended by No. 453; By-laws Nos. 630 and 654 of the Corporation of the Township of Brock; By-law No. 296 of the Corporation of the Township of Clinton; By-law No. 9 of 1917 of the Corporation of the Township of Derby; By-law No. 470 of the Corporation of the Township of Mara; By-law No. 23 of the Corporation of the Township of Stamford; By-law No. 247 of the Corporation of the Township of Thorah; By-law No. 997 of the Corporation of the Township of Whitby; By-law No. 1189 of the Township of Etobicoke, and By-law No. 826 of the Corporation of the Township of East Whitby are confirmed and declared to be legal, valid and binding upon such corporations and the ratepayers thereof, respectively, and shall not be open to question upon any ground whatsoever, notwithstanding the requirements of *The Power Commission Act* or the amendments thereto or any other statute.

Certain corporations added as parties to contract with Commission.

**17.** The Municipal Corporation of the City of Chatham, the Municipal Corporation of the Town of Aylmer, the Municipal Corporation of the Town of Parkhill, the Municipal Corporation of the Village of Drayton, the Municipal Corporation of the Village of Oil Springs, the Police Village of Brigden, the Police Village of Moorefield, the Municipal Corporation of the Township of Clinton and the Municipal Corporation of the Township of Stamford are added as parties of the second part of the contract set out in Schedule "A" to the Power Commission Act, 1909, as varied, confirmed and amended by the said Act, and as further varied, confirmed and amended by the Act passed in the tenth year of the reign of His late Majesty King Edward VII, chaptered 16, and by subsequent Acts and by this Act, and the said contract shall be binding upon the parties thereto respectively, as to the City of Chatham, from the 3rd day of October, 1915; as to the Town of Aylmer from the 15th day of May, 1917; as to the Town of Parkhill from the 5th day of November, 1917; as to the Village of Drayton from the 5th day of July, 1917; as to the Village of Oil Springs from the 9th day of April, 1917; as to the Police Village of Brigden from the 20th day of March, 1917; as to the Police Village of Moorefield from the 25th day of

September, 1917; as to the Township of Clinton from the 14th day of November, 1917, and as to the Township of Stamford from the 12th day of March, 1917.

18. The names of the said municipal corporations are added to Schedule "B" of the said contract, and such schedule shall be read as containing the particulars set out in Schedule "A" to this Act.

Additions  
to contract  
for Niagara  
Falls  
system.

SCHEDULE "A."

Name of Municipal Corporation.	Quantity of Power Applied for in H.P.	Maximum Price of Power at Niagara Falls.	*Number of Volts.	Estimate maximum cost of power ready for distribution in Municipality.	Estimate proportionate part of costs to construct transmission line, transformer station and works for nominally 30,000 H.P., with total capacity of 60,000 H.P.		Estimate proportionate part of line loss and of part cost to operate, maintain, repair, renew and insure transmission line, transformer stations and works for nominally 30,000 H.P., with total capacity of 60,000 H.P.	
					\$	c.	\$	c.
Chatham .....	1,000	..	..	30 78	1,929	70	10,588	00
Aylmer .....	200	..	..	39 00	540	52	2,865	00
Parkhill .....	75	..	..	75 23	408	13	1,978	00
Drayton .....	100	..	..	60 45	468	47	2,259	00
Oil Springs .....	75	..	..	38 54	194	72	1,021	00
Brigden .....	50	..	..	57 56	203	74	1,129	00
Moorefield .....	25	..	..	63 92	125	16	598	00
Clinton Township .....	..	..	..	....	.....	.....	.....	.....
Stamford Township ...	400	..	..	16 57	123	28	998	00

\* Number required by each Corporation.

19. The agreements set out as Schedules "B," "C," "D," "E," "F," "G," "H," "I," "J," "K," "L," "M," "N," "O," "P," "Q," "R," "S," "T," and "U," between the City of Fort William, the City of Port Arthur, the Town of Alliston, the Town of Hanover, the Town of Perth, the Town of Picton, the Town of Smith's Falls, the Village of Beeton, the Village of Bloomfield, the Village of Bradford, the Village of Cookstown, the Village of Tottenham, the Village of Wellington, the Police Village of Omemee, the Township of Brock, the Township of Derby, the Township of Thorah, the Township of Whitby, the Township of East Whitby and the Agreement for purchase of Stock

Contracts  
confirmed.



in Company by the Hydro-Electric Power Commission of Ontario, between John Joseph Albright, The Hydro-Electric Power Commission of Ontario, His Majesty the King, The Ontario Power Company of Niagara Falls, The Ontario Transmission Company, Limited, and Niagara, Lockport and Ontario Power Company, are hereby confirmed and declared to be legal, valid and binding upon the parties thereto respectively and shall not be open to question upon any ground whatsoever, notwithstanding the requirements of *The Power Commission Act*, or amendments thereto or any other statute.

#### SCHEDULE "B."

This Indenture made in duplicate the tenth day of October in the year of our Lord nineteen hundred and seventeen (1917).

Between

The Hydro-Electric Power Commission of Ontario, hereinafter called the "Commission," party of the first part;

and

The Municipal Corporation of the City of Fort William, hereinafter called the "Corporation," party of the second part.

Whereas, pursuant to an Act to provide for the transmission of electrical power to municipalities, known as *The Power Commission Act*, and amendments thereto, the Corporation has passed the necessary enabling by-law and received from the Commission estimates on the cost of electric power or energy delivered to the Corporation, and the ratepayers of the Corporation assented to the by-laws authorizing the Corporation to enter into such an agreement with the Commission for such power;

And whereas, in accordance with the powers conferred by Legislature upon the Commission by the said Act and amendments thereto, the Commission intends either to purchase, acquire or construct generating stations, hydraulic plants, lines, substations and all works in connection therewith required for the purpose of supplying power hereunder, or to enter into an agreement with one or more power generating companies or individuals for a supply of power required hereunder, and to construct the necessary stations, plant, lines and equipment to transmit, transform and deliver said power to the Corporation;

And whereas the purchase of, acquiring of or the construction of the said generating station, hydraulic plant, works, lines, sub-stations and equipment, or the purchase of said power and the construction of the necessary stations, plant, lines and equipment will be made for the purpose of supplying to better advantage and with greater efficiency the power requirements of the various municipalities located in the District of Thunder Bay;

And whereas the Corporation is now receiving electric power or energy under agreements with the Kaministiquia Power Company, Limited, dated March the fourteenth, nineteen hundred and sixteen and nineteen hundred and five;

And whereas it is the intention of the Corporation to take all excess power, over and above that required by the power agreement between the Corporation and the Kaministiquia Power Company aforesaid during the life of said agreement, from the Commission;

And whereas it is the intention of the Corporation to take power exclusively from the Commission after the expiration of the said power agreements with the Kaministiquia Power Company;

1. Now therefore this indenture witnesseth that in consideration of the premises and of the agreements of the Corporation herein set forth, subject to the provisions of the said Act and amendments thereto, the Commission and the Corporation mutually agree with each other as follows:—

2. The Commission agrees:—

(a) To reserve and deliver within a reasonable time after the receipt of written notice from the Corporation three thousand horsepower (3,000 H.P.) or more of electrical power or energy to the Corporation.

(b) At the expiration of reasonable notice in writing which may be given by the Corporation from time to time during the continuance of this agreement, to reserve for and deliver to the Corporation additional electric power when called for.

(c) To use at all times first-class, modern, standard commercial apparatus and plant, and to exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Corporation.

(d) To deliver commercially continuous twenty-four hour (24 hour) power every day in the year to the Corporation at the distribution bus bars in the Commission's sub-station within the Corporation's limits.

(e) To take all necessary steps and make all necessary agreements and do all necessary work to either purchase power or purchase, acquire or construct the necessary electric power-generating stations, hydraulic plants, lines, sub-stations and works for the purpose of this agreement.

3. The Corporation agrees:—

(a) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power dealt with by this agreement so as to be able to receive power when the Commission is ready to deliver same.

(b) Beginning on the date of expiration of the existing power agreement, dated nineteen hundred and five, between the Corporation and the Kaministiquia Power Company, Limited, or should the Corporation hereafter order by written notice hereunder a supply of power to be held in reserve by the Commission prior to that date, then beginning on the date when said power ordered is ready for delivery to the Corporation:

To pay annually, interest at the rate payable by the Commission upon the Corporation's proportionate part (based on the quantity of electrical energy or money taken or held in reserve for the Corporation) of all moneys

expended by the Commission on capital account for the acquiring of properties and rights, the acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations, and other works necessary for the delivery of said electrical energy or power to the Corporation under the terms of this contract.

Also to pay an annual sinking fund instalment of such an amount as to form at the end of forty years with accrued interest, a sinking fund sufficient to repay the Corporation's proportionate part, based as aforesaid, of all moneys advanced by the Province of Ontario for the acquiring of properties and rights, the acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations and other works necessary for the delivery of said electric energy or power, delivered to the Corporation under the term of this contract.

Also to pay the Corporation's proportionate part, based as aforesaid, of the cost of power purchased or generated, and the cost of operating, maintaining, repairing, renewing and insuring said generating plants, transformer stations, transmission lines, distributing stations and other necessary works, subject to adjustment under clause 7 of this agreement.

(c) The amounts payable under this contract shall be paid in twelve monthly payments, in gold coin of the present standard of weight and fineness, at the office of the Commission at Toronto. Bills shall be rendered by the Commission on or before the fifth (5th) day of each month and paid by the Corporation on or before the last day of each month. If any bill remains unpaid for fifteen (15) days, the Commission may, in addition to all other remedies and without notice, discontinue the supply of power to the Corporation until such bill is paid. No such discontinuance shall relieve the Corporation from the performance of the covenants, provisos and conditions herein contained. All payments in arrears shall bear interest at the legal rate.

(d) To take all electric power or energy in excess of that required to be taken under said power agreements with the Kaministiquia Power Company, from the Commission, during the remaining life of said agreements. To cancel and terminate, at their expiration, the said agreements with the Kaministiquia Power Company, and thereafter take electric power exclusively from the Commission for the life of the within agreement. Nothing herein contained shall be construed to compel the Corporation during the remaining life of the said agreements with the Kaministiquia Power Company to order part of its power from the Commission unless the quantity desired to be so taken can be supplied by the Commission at a cost equal to or better than the cost of power from the Kaministiquia Power Company as set forth and contained in the present agreements with the Corporation dated nineteen hundred and five and March the fourteenth, nineteen hundred and sixteen.

(e) To co-operate, by all means in its power at all times with the Commission to increase the quantity of power required from the Commission, and in all other respects to carry out the object of this agreement, and of the said Act and any amendments thereto.

(f) To pay as a minimum for three-fourths of the power ordered from time to time by the Corporation and held in reserve for it as herein provided,



whether it takes the same or not. When the highest average amount of power taken for any twenty (20) consecutive minutes during any month shall exceed during the twenty (20) consecutive minutes three-fourths of the amount ordered by the Corporation and held in reserve, then the Corporation shall pay for the greater amount during the entire month.

(g) If the Corporation during any month takes more than the amount of power ordered and held in reserve for it, as determined by an integrated peak, or highest average for a period of twenty (20) consecutive minutes, the taking of such excess shall thereafter constitute an obligation on the part of the Corporation to pay for, and on the part of the Commission to hold in reserve, such increased quantity of power, in accordance with the terms and conditions of this contract.

(h) When the power factor at any time falls below ninety per cent. (90%) the Corporation shall pay for 90 per cent. (90%) of the kilovolt amperes, providing that said ninety per cent. (90%) of said kilovolt amperes is greater than the maximum kilowatts for any twenty (2) minute period during the month.

(i) To use at all times first-class, modern, standard commercial apparatus and plant, to be approved by the Commission.

(j) To exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Commission and of the Corporation.

4. This agreement shall remain in force for forty (40) years from the twenty-sixth of April, Nineteen hundred and twenty, subject to section 10 hereof.

5. It is further mutually agreed:—

(a) The power shall be alternating, three-phase, having a periodicity of approximately sixty (60) cycles per second and shall be delivered, as aforesaid, at a voltage suitable for local distribution.

(b) That the meters for measuring the power supplied hereunder, with their series and potential transformers, shall be connected at the point of delivery, or at any other point as may be decided by the Commission.

(c) That the maintenance by the Commission of approximately the agreed voltage at approximately the agreed frequency at the sub-station in the limits of the Corporation shall constitute the supply of all power involved herein and the fulfilment of all operating obligations hereunder, and when the voltage and frequency are so maintained, the amount of power, its fluctuations, load factor, power factor, distribution as to phases and all other electrical characteristics and qualities are under the sole control of the Corporation, their agents, customers, apparatus, appliances and circuits.

6. The Engineers of the Commission, or one or more of them or any other person or persons appointed for this purpose by the Commission, shall have the right, from time to time, during the continuance of this agreement, to inspect the apparatus, plant and property of the Corporation, and take records at all reasonable hours.

7. The Commission shall at least annually adjust and apportion the amount or amounts payable by the Municipal Corporation or Corporations for such power and such interest, sinking fund, cost of lost power and cost of generating, operating maintaining, repairing, renewing and insuring said works.

If at any time any other Municipal Corporation, or, pursuant to said Act, any railway or distributing company, or any other Corporation or person, applies to the Commission for a supply of power, the Commission shall notify the applicant and the involved Corporation or Corporations, in writing, of a time and place to hear all representations that may be made as to the terms and conditions for such supply.

Without discrimination in favour of the applicants as to the price to be paid for equal quantities of power, the Commission may supply power upon such terms and conditions as may, having regard to the risk and expense incurred, and paid, and to be paid by the Corporation, appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

No such application shall be granted if the said works or any part thereof are not adequate for such supply, or if the supply of the Corporation will be thereby injuriously affected, and no power shall be supplied within the limits of a Municipal Corporation taking power from the Commission at the time of such application, without the written consent of such Corporation.

In determining the quantity of power supplied to a Municipal Corporation, the quantity supplied by the Commission within the limits of the Corporation to any applicant, other than a Municipal Corporation, shall be computed as part of the quantity supplied to such Corporation, but such Corporation shall not be liable for payment for any portion of the power so supplied. No power shall be supplied by the Municipal Corporation to any railway or distributing company, without the written consent of the Commission. Power shall not be sold for less than the cost, and there shall be no discrimination as regards price and quantity.

8. It is hereby declared that the Commission is to be a trustee of all property held by the Commission under this agreement for the Corporation or Corporations supplied by the Commission, but the Commission shall be entitled to a lien upon said property for all moneys expended by the Commission under this agreement and not repaid. At the expiration of this agreement the Commission shall determine and adjust the rights of the Corporation and any other (if any), supplied by the Commission, having regard to the amounts paid by them respectively under the terms of this agreement, and such other considerations as may appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

9. If differences arise on power matters between Corporations to which the Commission is supplying power, the Commission may, upon application, fix a time and place to hear all representations that may be made by the parties, and the Commission shall, in a summary manner when possible, adjust such differences, and such adjustment shall be final.

The Commission shall have all the powers that may be conferred upon a Commission appointed under the *Act respecting Enquiries Concerning Public Matters*.

10. Notwithstanding anything herein contained to the contrary, it is hereby understood and agreed that this agreement shall come into effect upon the date of its approval by the Lieutenant-Governor in Council, or its ratification by the Legislature of the Province of Ontario.

11. This agreement shall extend to, be binding upon and enure to the benefit of the successors and assigns of the parties hereto.

In witness whereof, the Commission and the Corporation have respectively affixed their corporate seals and the hands of their proper officers.

THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

(Signed) A. BECK, *Chairman*.

(Seal.)

(Signed) W. W. POPE, *Secretary*.

MUNICIPAL CORPORATION OF THE CITY OF FORT WILLIAM.

(Signed) H. MURPHY, *Mayor*.

(Seal.)

(Signed) A. McNAUGHTON, *Clerk*.

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SCHEDULE "C."

This Indenture made in duplicate the seventh day of May, in the year of our Lord one thousand nine hundred and seventeen (1917),

Between

The Hydro-Electric Power Commission of Ontario, hereinafter called the "Commission," party of the first part;

and

The Municipal Corporation of the City of Port Arthur, hereinafter called the "Corporation," party of the second part.

Whereas, pursuant to "An Act to provide for the transmission of electrical power to Municipalities, known as the Power Commission Act," and amendments thereto, the Commission entered into an agreement with the Corporation for a supply of electrical energy dated the thirteenth day of January, one thousand nine hundred and ten (1910) (and the ratepayers of the Corporation assented to the by-laws authorizing the Corporation to enter into such an agreement with the Commission for such power):

And whereas in accordance with the powers conferred by Legislature upon the Commission by the said Act and amendments thereto, the Commission intends either to purchase, acquire or construct generating stations, hydraulic



plants, lines, sub-stations and all works in connection therewith required for the purpose of supplying power hereunder, or to enter into an agreement with one or more power generating companies or individuals for a supply of power required hereunder, and to construct the necessary stations, plant, lines and equipment to transmit, transform and deliver said power to the Corporation;

And whereas the purchase of, acquiring of, or the construction of the said generation station, hydraulic plant, works, lines, sub-stations and equipment, or the purchase of said power and the construction of the necessary stations, plant, lines and equipment will be made for the purpose of supplying to better advantage and with greater efficiency the power requirements of the various municipalities located in the district of Thunder Bay;

And whereas in order to meet such changed conditions it is the intention of both parties hereto that the present power agreement dated January thirteenth, one thousand nine hundred and ten (1910) be superseded upon its termination by this agreement.

1. Now, therefore, this indenture witnesseth that in consideration of the premises and of the agreements of the Corporation herein set forth, subject to the provisions of the said Act and amendments thereto, the Commission and the Corporation mutually agree with each other as follows:

2. The Commission agrees:—

(a) To reserve for and deliver to the Corporation on or before the twenty-sixth day of April, 1920, ten thousand horse-power (10,000 h.p.) or more of electrical power or energy.

(b) At the expiration of reasonable notice in writing which may be given by the Corporation from time to time during the continuance of this agreement, to reserve for and deliver to the Corporation additional electric power when called for.

(c) To use at all times first-class, modern standard commercial apparatus and plant, and to exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Corporation.

(d) To deliver commercially continuous twenty-four (24) hour power every day in the year to the Corporation at the distribution bus bars in the Commission's sub-station within the Corporation's limits.

(e) To take all necessary steps and make all necessary agreements and do all necessary work to either purchase power or purchase, acquire or construct the necessary electric power generating stations, hydraulic plants, lines, sub-stations and works for the purposes of this agreement.

3. The Corporation agrees:—

(a) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power dealt with by this agreement so as to be able to receive power when the Commission is ready to deliver same.

(b) To pay annually, interest at the rate payable by the Commission upon the Corporation's proportionate part (based on the quantity of electrical energy or power taken, or held in reserve for the Corporation) of all moneys expended by the Commission on capital account for the acquiring of properties and rights, the acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations, and other works necessary for the delivery of said electrical energy or power to the Corporation under the terms of this contract.

Also to pay an annual sinking fund instalment of such an amount as to form at the end of forty (40) years, with accrued interest, a sinking fund sufficient to repay the Corporation's proportionate part, based as aforesaid, of all moneys advanced by the Province of Ontario for the acquiring of properties and rights, the acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations and other work necessary for the delivery of said electrical energy or power, delivered to the Corporation under the terms of this contract.

Also to pay the Corporation's proportionate part, based as aforesaid, of the cost of power purchased or generated and lost power, the cost of operating, maintaining, repairing, renewing and insuring said generating plants, transformer stations, transmission lines, distributing stations and other necessary works. Subject to adjustment under clause 7 of this agreement.

(c) The amounts payable under this contract shall be paid in twelve (12) monthly payments, in gold coin of the present standard of weight and fineness, at the offices of the Commission at Toronto. Bills shall be rendered by the Commission on or before the fifth (5th) day of each month and paid by the Corporation on or before the fifteenth (15th) day of each month. If any bill remains unpaid for fifteen (15) days, the Commission may, in addition to all other remedies and without notice, discontinue the supply of power to the Corporation until such bill is paid. No such discontinuance shall relieve the Corporation from the performance of the covenants, provisions and conditions herein contained. All payments in arrears shall bear interest at the legal rate.

(d) To take electric power exclusively from the Commission during the continuance of this agreement.

(e) To co-operate by all means in its power at all times with the Commission to increase the quantity of power required from the Commission, and in all other respects to carry out the objects of this agreement and of the said Act and any amendments thereto.

(f) To pay as a minimum for three-fourths of the power ordered from time to time by the Corporation and held in reserve for it as herein provided, whether it takes the same or not. When the highest average amount of power taken for any twenty (20) consecutive minutes during any month shall exceed during the twenty (20) consecutive minutes three-fourths of the amount ordered by the Corporation and held in reserve, then the Corporation shall pay for this greater amount of power during the entire month.

(g) If the Corporation during any month takes more than the amount of power ordered and held in reserve for it, as determined by an integrated

peak, or highest average, for a period of twenty (20) consecutive minutes, the taking of such excess shall thereafter constitute an obligation on the part of the Corporation to pay for, and on the part of the Commission to hold in reserve, such increased quantity of power in accordance with the terms and conditions of this contract.

(h) When the power factor at any time falls below ninety per cent. (90 per cent.) the Corporation shall pay for ninety per cent. (90 per cent.) of the kilovolt amperes, providing that said ninety per cent. (90 per cent.) of said kilovolt amperes is greater than the maximum kilowatts for any twenty (20) minute period during the month.

(i) To use at all times first-class, modern, standard commercial apparatus and plant, to be approved by the Commission.

(j) To exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Commission and of the Corporation.

4. This agreement shall remain in force for forty (40) years from the expiration of the said agreement between the parties hereto and dated the thirteenth day of January, one thousand nine hundred and ten (1910), subject to section 10 hereof.

5.—(a) The power shall be alternating, three-phase, having a periodicity of approximately sixty (60) cycles per second and shall be delivered as aforesaid at a voltage suitable for local distribution.

(b) That the meters for measuring the power supplied hereunder, with their series and potential transformers, shall be connected at the point of delivery, or at any other point as may be decided by the Commission.

(c) That the maintenance by the Commission of approximately the agreed voltage at approximately the agreed frequency at the sub-station in the limits of the Corporation shall constitute the supply of all power involved herein and the fulfilment of all operating obligations hereunder, and when the voltage and frequency are so maintained, the amount of power, its fluctuations, load factor, power factor, distribution as to phases and all other electrical characteristics and qualities are under the sole control of the Corporation, their agents, customers, apparatus, appliances and circuits.

6. The engineers of the Commission, or one or more of them, or any other person or persons appointed for this purpose by the Commission, shall have the right from time to time during the continuance of this agreement to inspect the apparatus, plant and property of the Corporation and take records at all reasonable hours.

7. The Commission shall at least annually adjust and apportion the amount or amounts payable by the Municipal Corporation or Corporations for such power and such interest, sinking fund, cost of lost power, and cost of generating, operating, maintaining, repairing, renewing and insuring said works.

If at any time any other Municipal Corporation, or pursuant to said Act, any railway or distributing company, or any other Corporation or person,



applies to the Commission for a supply of power, the Commission shall notify the applicant and the involved Corporation or Corporations in writing, of a time and place to hear all representations that may be made as to the terms and conditions for such supply.

Without discrimination in favor of the applicants as to the price to be paid, for equal quantities of power, the Commission may supply power upon such terms and conditions as may, having regard to the risk and expense incurred and paid, and to be paid by the Corporation, appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

No such application shall be granted if the said works or any part thereof are not adequate for such supply, or if the supply of the Corporation will be thereby injuriously affected, and no power shall be supplied within the limits of a Municipal Corporation taking power from the Commission at the time of such application without the written consent of such Corporation.

In determining the quantity of power supplied to a Municipal Corporation, the quantity supplied by the Commission within the limits of the Corporation to any applicant, other than a Municipal Corporation, shall be computed as part of the quantity supplied to such Corporation, but such Corporation shall not be liable for payment for any portion of the power so supplied. No power shall be supplied by the Municipal Corporation to any railway or distributing company without the written consent of the Commission. Power shall not be sold for less than the cost and there shall be no discrimination as regards price and quantity.

8. It is hereby declared that the Commission is to be a trustee of all property held by the Commission under this agreement for the Corporation or Corporations supplied by the Commission, but the Commission shall be entitled to a lien upon said property for all moneys expended by the Commission under this agreement and not repaid. At the expiration of this agreement the Commission shall determine and adjust the rights of the Corporation and any other (if any) supplied by the Commission, having regard to the amounts paid by them respectively under the terms of this agreement, and such other considerations as may appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

9. If differences arise on power matters between Corporations to which the Commission is supplying power, the Commission may, upon application, fix a time and place to hear all representations that may be made by the parties and the Commission shall, in a summary manner, where possible, adjust such differences and such adjustment shall be final.

The Commission shall have all the powers that may be conferred upon a Commissioner appointed under the *Act Respecting Enquiries Concerning Public Matters*.

10. Notwithstanding anything herein contained to the contrary, it is hereby understood and agreed that this agreement shall come into effect upon the date of its approval by the Lieutenant-Governor in Council, or its ratification by the Legislature of the Province of Ontario, and that the said agreement between the parties hereto bearing date the thirteenth day of January, one thousand nine hundred and ten (1910) shall be terminated on the twenty-sixth day of April, 1920, and be superseded by this agreement.

11. This agreement shall extend to, be binding upon, and enure to the benefit of the successors and assigns of the parties hereto.

In witness whereof the Commission and the Corporation have respectively affixed their corporate seals and the hands of their proper officers.

HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

A. BECK, *Chairman.*

(Seal.)

W. W. POPE, *Secretary.*

MUNICIPAL CORPORATION OF THE CITY OF PORT ARTHUR.

W. MARRIGAN, *Acting Mayor.*

(Seal.)

T. F. MILNE, *Clerk.*

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SCHEDULE "D."

This Indenture made in duplicate the 7th day of June, in the year of Our Lord, 1917.

Between

The Hydro-Electric Power Commission of Ontario, hereinafter called the "Commission," party of the first part;

and

The Municipal Corporation of the Town of Alliston, hereinafter called the "Corporation," party of the second part.

Where as, pursuant to an Act to provide for the transmission of electrical power to municipalities, known as the *Power Commission Act* and amendments thereto, the Corporation applied to the Commission for a supply of power, and the commission furnished the Corporation with estimates of the total cost of such power, ready for distribution within the limits of the Corporation (and the electors of the Corporation assented to the by-laws authorizing the Corporation to enter into a contract with the Commission for such power).

1. Now, therefore, this indenture witnesseth that in consideration of the premises and of the agreement of the Corporation herein set forth, subject to the provisions of the said Act and amendments thereto, the Commission agrees with the Corporation:

(a) To reserve and deliver at the earliest possible date two hundred and fifty (250) h.p. or more of electrical power to the Corporation.

(b) At the expiration of reasonable notice in writing, which may be given by the Corporation from time to time during the continuance of this agreement, to reserve and deliver to the Corporation additional electric power when called for.

(c) To use at all time first-class, modern, standard, commercial apparatus and plant, and to exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Corporation.

(d) To deliver commercially continuously 24 hour power every day in the year to the Corporation at the distribution bus bars in the Commission's substation within the Corporation's limits.

2. In consideration of the premises and of the agreements herein set forth, the Corporation agrees with the Commission:

(a) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power dealt with by this agreement so as to be able to receive power when the Commission is ready to deliver same.

(b) To pay annually interest at rate payable by the Commission upon the Corporation's proportionate part (based on the quantity of electrical energy or power taken), of all monies expended by the Commission on capital account for the acquiring of properties and rights the acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations, and other works necessary for the delivery of said electrical energy or power to the Corporation under the terms of this contract.

Also to pay an annual sinking fund instalment of such amount as to form at the end of 30 years, with accrued interest, a sinking fund sufficient to repay the Corporation's proportionate part, based as aforesaid, of all monies advanced by the Province of Ontario, for the acquiring of properties and rights, the acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations and other work necessary for the delivery of said electrical energy or power, delivered to the Corporation under the terms of this contract. Also to pay the Corporation's proportionate part, based as aforesaid, of the cost of lost power and of the cost of operating, maintaining, repairing, renewing and insuring said generating plants, transformer stations, transmission lines, distributing stations and other necessary work. Subject to adjustment under clause 6 of this agreement.

(c) The amounts payable under this contract shall be paid in twelve monthly payments, in gold coin of the present standard of weight and fineness, at the offices of the Commission at Toronto. Bills shall be rendered by the Commission on or before the 5th day and paid by the Corporation on or before the 15th day of each month. If any bill remains unpaid for fifteen days, the Commission may, in addition to all other remedies and without notice, discontinue the supply of power to the Corporation until said bill is paid. No such discontinuance shall relieve the Corporation from the performance of the covenants, provisoes and conditions herein contained. All payments in arrears shall bear interest at the legal rate.

(d) To take electric power exclusively from the Commission during the continuance of this agreement.



(e) To co-operate by all means in its power at all times with the Commission to increase the quantity of power required from the Commission, and in all other respects to carry out the objects of this agreement, and of the said Act.

(f) To pay for three-fourths of the power ordered from time to time by the Corporation and held in reserve for it as herein provided, whether it takes the same or not. When the highest average amount of power taken for any twenty consecutive minutes during any month shall exceed during the twenty consecutive minutes three-fourths of the amount ordered by the Corporation and held in reserve, then the Corporation shall pay for this greater amount during the entire month.

(g) If the Corporation during any month takes more than the amount of power ordered and held in reserve for it, as determined by an integrated peak, or highest average, for a period of twenty consecutive minutes, the taking of such excess shall thereafter constitute an obligation on the part of the Corporation to pay for, and on the part of the Commission to hold in reserve, such increased quantity of power in accordance with the terms and conditions of this contract.

(h) When the power factor at any time falls below ninety per cent. (90%) the Corporation shall pay for ninety per cent. (90%) of the kilovolt amperes, providing that said ninety per cent. (90%) of said kilovolt amperes is greater than the maximum kilowatts for any twenty (20) minute period during the month.

(i) To use at all times first-class, modern, standard commercial apparatus and plant, to be approved by the Commission.

(j) To exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Commission and of the Corporation.

3. This agreement shall remain in force for thirty years from date of the first delivery of power under this contract.

4. The power shall be alternating, three-phase, having a periodicity of approximately 60 cycles per second and shall be delivered as aforesaid at a voltage suitable for local distribution.

(a) That the meters with their series and potential transformers shall be connected at the point of delivery.

(b) The maintenance by the Commission of approximately the agreed voltage at approximately the agreed frequency at the sub-station in the limits of the Corporation shall constitute the supply of all power involved herein and the fulfilment of all operating obligations hereunder, and when voltage and frequency are so maintained the amount of power, its fluctuations, load factor, power factor, distribution as to phases and all other electric characteristics and qualities, are under the sole control of the Corporation, their agents, customers, apparatus, appliances and circuits.

5. The engineers of the Commission, or one or more of them, or any other person or persons appointed for this purpose by the Commission shall have

the right from time to time during the continuance of this agreement to inspect the apparatus, plant and property of the Corporation and take records at all reasonable hours.

6. The Commission shall at least annually adjust and apportion the amount or amounts payable by the Municipal Corporation or Corporations for such power and such interest, sinking fund, cost of lost power and cost of generating, operating, maintaining, repairing, renewing and insuring said works.

If at any time any other municipal corporation, or pursuant to said Act, any railway or distributing company, or any other corporations or person, applies to the Commission for a supply of power, the Commission shall notify the applicant and the involved Corporation or Corporations in writing, of a time and place to hear all representations that may be made as to the terms and conditions for such supply.

Without discrimination in favor of the applications as to the price to be paid, for equal quantities of power, the commission may supply power upon such terms and conditions as may, having regard to the risk and expense incurred, and paid, and to be paid by the Corporation, appear equitable to the Commission, and are approved by the Lieutenant-Governor in Council.

No such application shall be granted if the said works or any part thereof are not adequate for such supply, or if the supply of the Corporation will be thereby injuriously affected, and no power shall be supplied within the limits of a municipal corporation taking power from the Commission at the time of such application without the written consent of such Corporation.

In determining the quantity of power supplied to a municipal corporation, the quantity supplied by the Commission within the limits of the Corporation to any applicant, other than a municipal corporation, shall be computed as part of the quantity supplied to such Corporation, but such Corporation shall not be liable for payment for any portion of the power so supplied. No power shall be supplied by the Municipal Corporation to any railway or distributing company without the written consent of the Commission. Power shall not be sold for less than the cost and there shall be no discrimination as regards price and quantity.

7. It is hereby declared that the Commission is to be a trustee of all property held by the Commission under this agreement for the Corporation or Corporations supplied by the Commission, but the Commission shall be entitled to a lien upon said property for all monies expended by the Commission under this agreement and not repaid. At the expiration of this agreement the Commission shall determine and adjust the rights of the Corporation and any other (if any) supplied by the Commission, having regard to the amount paid by them respectively under the terms of this agreement, and such other consideration as may appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

8. If differences arise between Corporations to which the Commission is supplying power, the Commission may, upon application, fix a time and place and hear all representations that may be made by the parties and the Commission shall, in a summary manner when possible, adjust such differences and such adjustment shall be final. The Commission shall have all the

powers that may be conferred upon a commission appointed under the *Act respecting Enquiries Concerning Public Matters*.

9. This agreement shall extend to be binding upon, and enure to the benefit of the successors and assigns of the parties hereto.

In witness whereof the Commission and the Corporation have respectively affixed their corporate seals and the hands of their proper officers.

THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

(SEAL.)

A. BECK, *Chairman*.

W. W. POPE, *Secretary*.

MUNICIPAL CORPORATION OF THE TOWN OF ALLISTON.

(SEAL.)

J. H. MITCHELL, *Mayor*.

J. E. ADDIS, *Clerk*.

SCHEDULE "E."

This Indenture, made in duplicate the 8th day of June in the year of our Lord, one thousand nine hundred and seventeen,

Between

The Hydro-Electric Power Commission of Ontario, hereinafter called the "Commission," party of the first part;

and

The Municipal Corporation of the Town of Hanover, hereinafter called the "Corporation," party of the second part.

Whereas, pursuant to an Act to provide for the transmission of electrical power to municipalities known as *The Power Commission Act* and amendments thereto, the Corporation applied to the Commission for a supply of power, and the Commission furnished the Corporation with estimates of the total cost of such power, ready for distribution within the limits of the Corporation (and the electors of the Corporation assented to the by-laws authorizing the Corporation to enter into a contract with the Commission for such power).

1. Now, therefore, this Indenture witnesseth that in consideration of the premises and of the agreement of the Corporation herein set forth, subject to the provisions of the said Act and amendments thereto, the Commission agrees with the Corporation:

(a) To reserve and deliver at the earliest possible date three hundred (300) horse power of more of electrical power to the Corporation.



(b) At the expiration of reasonable notice in writing which may be given by the Corporation from time to time during the continuance of this agreement, to reserve and deliver to the Corporation additional electric power when called for.

(c) To use at all times first-class, modern, standard, commercial apparatus and plant, and to exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Corporation.

(d) To deliver commercially continuously 24-hour power every day in the year to the Corporation at the distribution bus bars in the Commission's substation within the Corporation's limits.

2. In consideration of the premises and of the agreements herein set forth, the Corporation agrees with the Commission:

(a) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power dealt with by this agreement so as to be able to receive power when the Commission is ready to deliver same.

(b) To pay annually, interest at rate payable by the Commission upon the Corporation's proportionate part (based on the quantity of electrical energy or power taken), of all monies expended by the Commission on capital account for the acquiring of properties and rights the acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations, and other works necessary for the delivery of said electrical energy or power to the Corporation under the terms of this contract.

Also to pay an annual sinking fund instalment of such amount as to form at the end of thirty years, with accrued interest, a sinking fund sufficient to repay the Corporation's proportionate part, based as aforesaid, of all monies advanced by the Province of Ontario, for the acquiring of properties and rights, the acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations and other work necessary for the delivery of said electrical energy or power, delivered to the Corporation under the terms of this contract. Also to pay the Corporation's proportionate part, based aforesaid, of the cost of lost power and of the cost of operating, maintaining, repairing, renewing and insuring said generating plants, transformer stations, transmission lines, distributing stations and other necessary work. Subject to adjustments under clause 6 of this agreement.

(c) The amounts payable under this contract shall be paid in twelve monthly payments, in gold coin of the present standard of weight and fineness, at the offices of the Commission at Toronto. Bills shall be rendered by the Commission on or before the 5th day and paid by the Corporation on or before the 15th day of each month. If any bill remains unpaid for fifteen days, the Commission may, in addition to all other remedies and without notice, discontinue the supply of power to the Corporation until said bill is paid. No such discontinuance shall relieve the Corporation from the performance of the covenants, provisions and conditions herein contained. All payments in arrears shall bear interest at the legal rate.

(d) To take electric power exclusively from the Commission during the continuance of this agreement.

all the powers that may be conferred upon a Commissioner appointed under the Act respecting enquiries concerning public matters.

9. This agreement shall extend to, be binding upon, and enure to the benefit of the successors and assigns of the parties hereto.

In witness whereof the Commission and the Corporation have respectively affixed their corporate seals and the hands of their proper officers.

THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

(SEAL.)

A. BECK, *Chairman.*

W. W. POPE, *Secretary.*

MUNICIPAL CORPORATION OF THE TOWN OF HANOVER.

(SEAL.)

A. B. TAYLOR, *Mayor.*

JOHN TAYLOR, *Clerk.*

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SCHEDULE "F."

This Indenture, made in duplicate the 26th day of November, in the year of our Lord one thousand nine hundred and seventeen (1917).

Between

The Hydro-Electric Power Commission of Ontario, hereinafter called the "Commission," party of the first part;

and

The Municipal Corporation of the Town of Perth, hereinafter called the "Corporation," party of the second part.

Whereas the Corporation, under the provisions of *The Power Commission Act* and amendments thereto, Revised Statutes of Ontario, Chapter 39, has applied to the Commission for a supply of power and has passed a By-law No. 1261, passed the 10th day of October to authorize the execution of an agreement therefor.

And whereas in accordance with the powers conferred by Legislature upon the Commission by the said Act and amendments thereto, the Commission intends either to purchase, acquire or construct generating stations, hydraulic plants, lines, substations and all works in connection therewith required for the purpose of supplying power hereunder, or to enter into an agreement with one or more power generating companies or individuals for a supply of power required hereunder, and to construct the necessary stations, plant, lines and equipment to transit, transform and deliver power to the Corporation.

Now, therefore, this indenture witnesseth that in consideration of the premises and of the agreement of the Corporation herein set forth, subject to the provisions of the said Act and amendments thereto, the parties hereto agree each with the other as follows:

1. The Commission agrees:—

(a) To reserve and deliver at the earliest possible date five hundred (500) horse power, or more, of electrical power to the Corporation.

(b) At the expiration of reasonable notice, in writing, which may be given by the Corporation from time to time during the continuance of this agreement, to reserve and deliver to the Corporation additional electric power when called for.

(c) To use at all time first-class, modern, standard commercial apparatus and plant, and to exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Corporation.

(d) To deliver commercially continuous twenty-four (24) hour power every day in the year to the Corporation at the distribution bus bars in the Commission's substation within the Corporation's limits.

2. The Corporation agrees:—

(a) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power dealt with by this agreement so as to be able to receive power when the Commission is ready to deliver same.

(b) To pay annually in twelve (12) equal monthly instalments, interest upon its proportionate part (based on the quantity of electrical energy or power taken) of all moneys expended by the Commission on capital account for the acquiring of properties and rights, the acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations, and other works necessary for the delivery of said electrical energy or power to the Corporation under the terms of this contract.

To pay an annual sum for its proportionate part of all moneys expended by the Commission on capital account for the acquiring of the said properties and rights, purchasing of power and the cost of the said construction, so as to form in thirty (30) years a sinking fund for the retirement of securities issued by the Province of Ontario.

Also to bear its proportionate part of the line loss and pay its proportionate part of the cost to operate, maintain, repair, renew and insure the said generating plants, transformer stations, transmission lines, distributing stations, and other necessary works.

All payments under this clause shall be subject to adjustment under paragraph 6.

(c) The amounts payable in accordance with clause 2 (b) shall be paid in gold coin of the present standard of weight and fineness, at the offices of the Commission at Toronto. Bills shall be rendered by the Commission on or before the 5th day and paid by the Corporation on or before the 15th



all the powers that may be conferred upon a Commissioner appointed under the Act respecting enquiries concerning public matters.

9. This agreement shall extend to, be binding upon, and enure to the benefit of the successors and assigns of the parties hereto.

In witness whereof the Commission and the Corporation have respectively affixed their corporate seals and the hands of their proper officers.

THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

(SEAL.)

A. BECK, *Chairman.*

W. W. POPE, *Secretary.*

MUNICIPAL CORPORATION OF THE TOWN OF HANOVER.

(SEAL.)

A. B. TAYLOR, *Mayor.*

JOHN TAYLOR, *Clerk.*

SCHEDULE "F."

This Indenture, made in duplicate the 26th day of November, in the year of our Lord one thousand nine hundred and seventeen (1917).

Between

The Hydro-Electric Power Commission of Ontario, hereinafter called the "Commission," party of the first part;

and

The Municipal Corporation of the Town of Perth, hereinafter called the "Corporation," party of the second part.

Whereas the Corporation, under the provisions of *The Power Commission Act* and amendments thereto, Revised Statutes of Ontario, Chapter 39, has applied to the Commission for a supply of power and has passed a By-law No. 1261, passed the 10th day of October to authorize the execution of an agreement therefor.

And whereas in accordance with the powers conferred by Legislature upon the Commission by the said Act and amendments thereto, the Commission intends either to purchase, acquire or construct generating stations, hydraulic plants, lines, substations and all works in connection therewith required for the purpose of supplying power hereunder, or to enter into an agreement with one or more power generating companies or individuals for a supply of power required hereunder, and to construct the necessary stations, plant, lines and equipment to transit, transform and deliver power to the Corporation.

Now, therefore, this indenture witnesseth that in consideration of the premises and of the agreement of the Corporation herein set forth, subject to the provisions of the said Act and amendments thereto, the parties hereto agree each with the other as follows:

1. The Commission agrees:—

(a) To reserve and deliver at the earliest possible date five hundred (500) horse power, or more, of electrical power to the Corporation.

(b) At the expiration of reasonable notice, in writing, which may be given by the Corporation from time to time during the continuance of this agreement, to reserve and deliver to the Corporation additional electric power when called for.

(c) To use at all time first-class, modern, standard commercial apparatus and plant, and to exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Corporation.

(d) To deliver commercially continuous twenty-four (24) hour power every day in the year to the Corporation at the distribution bus bars in the Commission's substation within the Corporation's limits.

2. The Corporation agrees:—

(a) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power dealt with by this agreement so as to be able to receive power when the Commission is ready to deliver same.

(b) To pay annually in twelve (12) equal monthly instalments, interest upon its proportionate part (based on the quantity of electrical energy or power taken) of all moneys expended by the Commission on capital account for the acquiring of properties and rights, the acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations, and other works necessary for the delivery of said electrical energy or power to the Corporation under the terms of this contract.

To pay an annual sum for its proportionate part of all moneys expended by the Commission on capital account for the acquiring of the said properties and rights, purchasing of power and the cost of the said construction, so as to form in thirty (30) years a sinking fund for the retirement of securities issued by the Province of Ontario.

Also to bear its proportionate part of the line loss and pay its proportionate part of the cost to operate, maintain, repair, renew and insure the said generating plants, transformer stations, transmission lines, distributing stations, and other necessary works.

All payments under this clause shall be subject to adjustment under paragraph 6.

(c) The amounts payable in accordance with clause 2 (b) shall be paid in gold coin of the present standard of weight and fineness, at the offices of the Commission at Toronto. Bills shall be rendered by the Commission on or before the 5th day and paid by the Corporation on or before the 15th

day of each month. If any bills remain unpaid for fifteen days the Commission may, in addition to all other remedies and without notice, discontinue the supply of power to the Corporation until said bill is paid. No such discontinuance shall relieve the Corporation from the performance of the covenants, provisos and conditions herein contained. All payments in arrears shall bear interest at the legal rate.

(d) To take power exclusively from the Commission during the continuance of this agreement.

(e) To pay for three-fourths of the power ordered from time to time by the Corporation and held in reserve for it as herein provided, whether it takes the same or not. When the highest average amount of power taken for any twenty consecutive minutes during any month exceeds during the twenty consecutive minutes three-fourths of the amount ordered by the Corporation and held in reserve, then the Corporation shall pay for this greater amount during the entire month.

If the Corporation during any month takes more than the amount of power ordered and held in reserve for it, as determined by an integrated peak, or the contract average, for a period of twenty consecutive minutes, the taking of such excess shall thereafter constitute an obligation on the part of the Corporation to pay for, and on the part of the Commission to hold in reserve such increased quantity of power in accordance with the terms and conditions of this contract.

(f) To take and use the three-phase power at all times in such manner that the power factor, *i.e.*, the ratio of the kilowatts to the kilovolt-amperes is a maximum, but, in any event, the Corporation shall pay for 90 per cent. of the maximum kilovolt-amperes considered as true power factor or kilowatts. The maximum in kilovolt-amperes or kilowatts shall be taken as the maximum average of integrated demand over any twenty consecutive minutes.

(g) To use at all times first-class, modern, standard commercial apparatus and plant, to be approved by the Commission, and to exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Commission and of the Corporation.

(h) To co-operate by all means in its power at all times with the Commission to increase the quantity of power required from the Commission and in all other respects to carry out the objects of this agreement, and of the said Act.

3. This agreement shall remain in force for thirty (30) years from the date of the first delivery of power under this contract.

4. The power shall be alternating, three-phase, having a periodicity of approximately 60 cycles per second, and shall be delivered as aforesaid at a voltage suitable for local distribution.

5. The engineers of the Commission, or one of more of them, or any other person or persons appointed for this purpose by the Commission, shall have the right from time to time, during the continuance of this agreement, to inspect the apparatus, plant, and property of the Corporation, and take records at all reasonable hours.



6. The Commission shall at least annually adjust and apportion the amount or amounts payable by the Municipal Corporation or Corporations for such power and such interest, sinking fund, cost of lost power and cost of generating, operating, maintaining, repairing, renewing and insuring said works.

7. It is hereby declared that the Commission is to be a trustee of all property held by the Commission under this agreement for the Corporations, and other Municipal Corporations supplied by the Commission, but the Commission shall be entitled to a lien upon said property for all moneys expended by the Commission under this agreement and not repaid. At the expiration of this agreement the Commission shall determine and adjust the rights of the Corporation and other Municipal Corporations, supplied by the Commission, having regard to the amounts paid by them, respectively, under the terms of this agreement, and such other considerations as may appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

8. If at any time any other municipal corporation, or pursuant to said Act, any railway or distributing company, or any other Corporation or person, applies to the Commission for a supply of power, the Commission shall notify the applicant and the Corporation, in writing of a time and place to hear all representations that may be made as to the terms and conditions for such supply.

Without discrimination in favor of the applicants as to the price to be paid, for equal quantities of power, the Commission may supply power upon such terms and conditions as may, having regard to the risk and expense incurred, and paid, and to be paid by the Corporation, appear equitable to the Commission, and are approved by the Lieutenant-Governor in Council.

No such application shall be granted if the said works, or any part thereof, are not adequate for such supply, or if the supply of the Corporation will be thereby injuriously affected, and no power shall be supplied within the limits of a municipal corporation taking power from the Commission at the time of such application, without the written consent of such Corporation.

In determining the quantity of power supplied to a municipal corporation, the quantity supplied by the Commission within the limits of the Corporation to any applicant, other than a municipal corporation, shall be computed as part of the quantity supplied to such Corporation, but such corporation shall not be liable for payment for any portion of the power so supplied. No power shall be supplied by the Municipal Corporation to any railway or distributing company, without the written consent of the Commission, but the Corporation may sell power to any person or persons, or manufacturing companies within the limits of the Corporation, but such power shall not be sold for less than cost; neither shall there be any discrimination as regards price and quantity.

9. If differences arise between Corporations to which the Commission is supplying power, the Commission may, upon application, fix a time and place and hear all representations that may be made by the parties, and the Commission shall, in a summary manner, when possible, adjust such differences, and such adjustment shall be final. The Commission shall have

all the powers that may be conferred upon a commissioner appointed under *The Act Respecting Enquiries Concerning Public Matters*.

10. This agreement shall extend to, be binding upon, and enure to the benefit of the successors and assigns of the parties hereto.

In witness whereof the Commission and the Corporation have respectively affixed their corporate seals and the hands of their proper officers.

HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

(SEAL.)

A. BECK, *Chairman*.

W. W. POPE, *Secretary*.

MUNICIPAL CORPORATION OF THE TOWN OF PERTH.

(SEAL.)

JAS. J. HANDS, *Mayor*.

JOHN A. KERR, *Clerk*.

SCHEDULE "G."

This Indenture, made in duplicate the 6th day of September, in the year of our Lord, one thousand nine hundred and seventeen (1917),

Between

The Hydro-Electric Power Commission of Ontario, hereinafter called the "Commission," party of the first part;

and

The Municipal Corporation of the Town of Picton, hereinafter called the "Corporation," party of the second part.

Whereas the Corporation, under the provisions of *The Power Commission Act* and amendments thereto, Revised Statutes of Ontario, Chapter 39, has applied to the Commission for a supply of power and has passed a By-law No. 265, passed the 30th day of July, 1915, to authorize the execution of an agreement therefor.

Now, therefore, this indenture witnesseth that in consideration of the premises and of the agreement of the Corporation herein set forth, subject to the provisions of the said Act and amendments thereto, the parties agree each with the other as follows:

1. The Commission agrees:—

(a) To reserve and deliver at the earliest possible date, two hundred (200) horse power, or more, of electrical power to the Corporation.

(b) At the expiration of reasonable notice, in writing, which may be given by the Corporation from time to time during the continuance of this agreement, to reserve and deliver to the Corporation additional electric power when called for.

(c) To use at all times first-class, modern, standard commercial apparatus and plant, and to exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Corporation.

(d) To deliver commercially continuous twenty-four (24) hour power every day in the year to the Corporation at the distribution bus bars in the Commission's substation within the Corporation's limits.

2. The Corporation agrees:

(a) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power dealt with by this agreement so as to be able to receive power when the Commission is ready to deliver same.

(b) To pay annually in twelve (12) equal monthly instalments, interest upon its proportionate part (based on the quantity of electrical energy or power taken) of all moneys expended by the Commission on capital account for the acquiring of properties and rights, the acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations, and other works necessary for the delivery of said electrical energy or power to the Corporation under the terms of this contract.

To pay an annual sum for its proportionate part of all moneys expended by the Commission on capital account for the acquiring of the said properties and rights, and the cost of the said construction, so as to form in thirty (30) years a sinking fund for the retirement of securities issued by the Province of Ontario.

Also to bear its proportionate part of the line loss and pay its proportionate part of the cost to operate, maintain, repair, renew, and insure the said generating plants, transformer stations, transmission lines, distributing stations, and other necessary works.

All payment under this clause shall be subject to adjustment under paragraph 6.

(c) The amounts payable in accordance with clause 2 (b) shall be paid in gold coin of the present standard of weight and fineness, at the offices of the Commission at Toronto. Bills shall be rendered by the Commission on or before the 5th day and paid by the Corporation on or before the 15th day of each month. If any bills remain unpaid for fifteen days the Commission may, in addition to all other remedies and without notice, discontinue the supply of power to the Corporation until said bill is paid. No such discontinuance shall relieve the Corporation from the performance of the covenants, provisos and conditions herein contained. All payments in arrears shall bear interest at the legal rate.

(d) To take electric power exclusively from the Commission during the continuance of this agreement.



(e) To pay for three-fourths of the power ordered from time to time by the Corporation and held in reserve for it as herein provided, whether it takes the same or not. When the highest average amount of power taken for any twenty consecutive minutes during any month exceeds during the twenty consecutive minutes three-fourths of the amount ordered by the Corporation and held in reserve, then the Corporation shall pay for this greater amount during the entire month.

If the Corporation during any month takes more than the amount of power ordered and held in reserve for it, as determined by an integrated peak, or the highest average, for a period of twenty consecutive minutes, the taking of such excess shall thereafter constitute an obligation on the part of the Corporation to pay for, and on the part of the Commission to hold in reserve, such increased quantity of power in accordance with the terms and conditions of this contract.

When the power factor of the highest average amount of power taken for said twenty consecutive minutes falls below 90 per cent., the Corporation shall pay for 90 per cent of the kilovolt amperes provided that said 90 per cent. (90%) of said kilovolt amperes is greater than the maximum kilowatts for any twenty (20) minute period during the month.

(f) To use at all times first-class, modern, standard, commercial apparatus and plant, to be approved by the Commission, and to exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Commission and of the Corporation.

(g) To co-operate by all means in its power at all times with the Commission to increase the quantity of power required from the Commission, and in all other respects to carry out the objects of this agreement, and of the said Act.

3. This agreement shall remain in force for thirty (30) years from the date of the first delivery of power under this contract.

4. The power shall be alternating, three-phase, having a periodicity of approximately 60 cycles per second, and shall be delivered as aforesaid at a voltage suitable for local distribution.

5. The engineers of the Commission, or one or more of them, or any other person or persons appointed for this purpose by the Commission, shall have the right from time to time, during the continuance of this agreement, to inspect the apparatus, plant, and property of the Corporation, and take records at all reasonable hours.

6. The Commission shall at least annually adjust and apportion the amount or amounts payable by the Municipal Corporation or Corporations for such power and such interest, sinking fund, cost of lost power and cost of generating, operating, maintaining, repairing and insuring said works.

7. It is hereby declared that the Commission is to be a trustee of all property held by the Commission under this agreement for the Corporations and other Municipal Corporations supplied by the Commission, but the Commission shall be entitled to a lien upon said property for all moneys expended by the Commission under this agreement and not repaid. At the expiration of this agreement the Commission shall determine and adjust the rights of the Corporations and other Municipal Corporations, supplied by the Commission, having regard to the amounts paid by them, respectively, under

the terms of this agreement, and such other considerations as may appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

8. If at any time any other Municipal Corporation, or pursuant to said Act, any railway or distributing company, or any other Corporation or person, applies to the Commission for a supply of power, the Commission shall notify the applicant and the Corporation, in writing, of a time and place to hear all representations that may be made as to the terms and conditions for such supply.

Without discrimination in favour of the applicants as to the price to be paid, for equal quantities of power, the Commission may supply power upon such terms and conditions as may, having regard to the risk and expense incurred, and paid, and to be paid by the Corporation, appear equitable to the Commission, and are approved by the Lieutenant-Governor in Council.

No such application shall be granted if the said works, or any part thereof, are not adequate for such supply, or if the supply of the Corporation will be thereby injuriously affected, and no power shall be supplied within the limits of a Municipal Corporation taking power from the Commission at the time of such application, without the written consent of such Corporation.

In determining the quantity of power supplied to a Municipal Corporation, the quantity supplied by the Commission within the limits of the Corporation to any applicant, other than a Municipal Corporation, shall be computed as part of the quantity supplied to such Corporation, but such Corporation shall not be liable for payment for any portion of the power so supplied. No power shall be supplied by the Municipal Corporation to any railway or distributing company, without the written consent of the Commission, but the Corporation may sell power to any person or persons, or manufacturing companies within the limits of the Corporation, but such power shall not be sold for less than cost; neither shall there be any discrimination as regards price and quantity.

9. If differences arise between Corporations to which the Commission is supplying power, the Commission may, upon application, fix a time and place and hear all representations that may be made by the parties, and the Commission shall, in a summary manner, when possible, adjust such differences, and such adjustment shall be final. The Commission shall have all the powers that may be conferred upon a commissioner appointed under the *Act respecting Enquiries concerning Public Matters*.

10. This agreement shall extend to, be binding upon, and enure to the benefit of the successors and assigns of the parties hereto.

In witness whereof, the Commission and the Corporation have respectively affixed their Corporate Seals and the hands of their proper officers.

HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

(Seal.)

A. BECK, *Chairman*.  
W. W. POPE, *Secretary*.

MUNICIPAL CORPORATION OF THE TOWN OF PICTON.

(Seal.)

A. W. HEASLIP, *Mayor*.  
P. C. MACNEE, *Clerk*.

## SCHEDULE "H."

This Indenture, made in duplicate the seventh day of September, in the year of our Lord one thousand, nine hundred and seventeen (1917),

Between

The Hydro-Electric Power Commission of Ontario, hereinafter called the "Commission," party of the first part;

and

The Municipal Corporation of the Town of Smith's Falls, hereinafter called the "Corporation," party of the second part.

Whereas the Corporation, under the provisions of *The Power Commission Act* and amendments thereto, Revised Statutes of Ontario, chapter 39, has applied to the Commission for a supply of power and has passed a by-law No. 1301, passed the 6th day of September, 1917, to authorize the execution of an agreement therefor.

Now therefore this Indenture witnesseth that in consideration of the premises and of the agreement of the Corporation herein set forth, subject to the provisions of the said Act and amendments thereto, the parties hereto agree each with the other as follows:

1. The Commission agrees:

(a) To reserve and deliver at the earliest possible date five hundred (500) horse power, or more, of electrical power to the Corporation.

(b) At the expiration of reasonable notice, in writing, which may be given by the Corporation from time to time during the continuance of this agreement, to reserve and deliver to the Corporation additional electric power when called for.

(c) To use at all times first-class, modern, standard commercial apparatus and plant, and to exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Corporation.

(d) To deliver commercially continuous twenty-four (24) hour power every day in the year to the Corporation at the distribution bus bars in the Commission's substation within the Corporation's limits.

2. The Corporation agrees:

(a) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power dealt with by this agreement so as to be able to receive power when the Commission is ready to deliver same.

(b) To pay annually in twelve (12) equal monthly instalments, interest upon its proportionate part (based on the quantity of electrical energy or power taken) of all moneys expended by the Commission on capital account



for the acquiring of properties and rights, the acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations, and other works necessary for the delivery of said electrical energy or power to the Corporation under the terms of this contract.

To pay an annual sum for its proportionate part of all moneys expended by the Commission on capital account for the acquiring of the said properties and rights, and the cost of the said construction, so as to form in thirty (30) years a sinking fund for the retirement of securities issued by the Province of Ontario.

Also to bear its proportionate part of the line loss and pay its proportionate part of the cost to operate, maintain, repair, renew, and insure the said generating plants, transformer stations, transmission lines, distributing stations, and other necessary works.

All payments under this clause shall be subject to adjustment under paragraph 6.

(c) The amounts payable in accordance with clause 2 (b) shall be paid in gold coin of the present standard of weight and fineness, at the offices of the Commission at Toronto. Bills shall be rendered by the Commission on or before the 5th day and paid by the Corporation on or before the 15th day of each month. If any bills remain unpaid for fifteen days the Commission may, in addition to all other remedies and without notice, discontinue the supply of power to the Corporation until said bill is paid. No such discontinuance shall relieve the Corporation from the performance of the covenants, provisoes and conditions herein contained. All payments in arrears shall bear interest at the legal rate.

(d) To pay for three-fourths of the power ordered from time to time by the Corporation and held in reserve for it as herein provided, whether it takes the same or not. When the highest average amount of power taken for any twenty consecutive minutes during any month exceeds during the twenty consecutive minutes three-fourths of the amount ordered by the Corporation and held in reserve, then the Corporation shall pay for this greater amount during the entire month.

If the Corporation during any month takes more than the amount of power ordered and held in reserve for it, as determined by an integrated peak, or the highest average, for a period of twenty consecutive minutes, the taking of such excess shall thereafter constitute an obligation on the part of the Corporation to pay for, and on the part of the Commission to hold in reserve, such increased quantity of power in accordance with the terms and conditions of this contract.

(e) To take and use the three-phase power at all times in such manner that the power factor, *i.e.*, the ratio of the kilowatts to the kilovolt-amperes is a minimum, but, in any event, the Corporation shall pay for 90% of the maximum kilovolt-amperes considered as true power factor or kilowatts. The maximum in kilovolt-amperes or kilowatts shall be taken as the maximum average or integrated demand over any ten consecutive minutes.

(f) To use at all times first-class, modern, standard commercial apparatus and plant, to be approved by the Commission, and to exercise all due skill

and diligence so as to secure satisfactory operation of the plant and apparatus of the Commission and of the Corporation.

(g) To co-operate by all means in its power at all times with the Commission to increase the quantity of power required from the Commission, and in all other respects to carry out the objects of this agreement, and of the said Act.

3. This agreement shall remain in force for thirty (30) years from the date of the first delivery of power under this contract.

4. The power shall be alternating, three-phase, having a periodicity of approximately 60 cycles per second, and shall be delivered as aforesaid at a voltage suitable for local distribution.

5. The engineers of the Commission, or one or more of them, or any other person or persons appointed for this purpose by the Commission, shall have the right, from time to time, during the continuance of this agreement, to inspect the apparatus, plant, and property of the Corporation, and take records at all reasonable hours.

6. The Commission shall at least annually adjust and apportion the amount or amounts payable by the Municipal Corporation or Corporations for such power and such interest, sinking fund, cost of lost power and cost of generating, operating, maintaining, repairing, renewing and insuring said works.

7. It is hereby declared that the Commission is to be a trustee of all property held by the Commission under this agreement for the Corporations and other Municipal Corporations supplied by the Commission, but the Commission shall be entitled to a lien upon said property for all moneys expended by the Commission under this agreement and not repaid. At the expiration of this agreement the Commission shall determine and adjust the rights of the Corporations and other Municipal Corporations, supplied by the Commission, having regard to the amounts paid by them, respectively, under the terms of this agreement, and such other considerations as may appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

8. If at any time any other Municipal Corporation, or pursuant to said Act, any railway or distributing company, or any other Corporation or person, applies to the Commission for a supply of power, the Commission shall notify the applicant and the Corporation in writing, of a time and place to hear all representations that may be made as to the terms and conditions for such supply.

Without discrimination in favour of the applicants as to the price to be paid, for equal quantities of power, the Commission may supply power upon such terms and conditions as may, having regard to the risk and expense incurred, and paid, and to be paid by the Corporation, appear equitable to the Commission, and are approved by the Lieutenant-Governor in Council.

No such application shall be granted if the said works, or any part thereof, are not adequate for such supply, or if the supply of the Corporation

will be thereby injuriously affected, and no power shall be supplied within the limits of a Municipal Corporation taking power from the Commission at the time of such application, without the written consent of such Corporation.

In determining the quantity of power supplied to a Municipal Corporation, the quantity supplied by the Commission within the limits of the Corporation to any applicant, other than a Municipal Corporation, shall be computed as part of the quantity supplied to such Corporation, but such Corporation shall not be liable for payment for any portion of the power so supplied. No power shall be supplied by the Municipal Corporation to any railway or distributing company, without the written consent of the Commission, but the Corporation may sell power to any person or persons, or manufacturing companies within the limits of the Corporation, but such power shall not be sold for less than cost; neither shall there be any discrimination as regards price and quantity.

9. If differences arise between Corporations to which the Commission is supplying power, the Commission may, upon application, fix a time and place and hear all representations that may be made by the parties, and the Commission shall, in a summary manner, when possible, adjust such differences, and such adjustment shall be final. The Commission shall have all the powers that may be conferred upon a commissioner appointed under the *Act Respecting Enquiries Concerning Public Matters*.

10. This agreement shall extend to, be binding upon, and enure to the benefit of the successors and assigns of the parties hereto.

In witness whereof the Commission and the Corporation have respectively affixed their Corporate Seals and the hands of their proper officers.

HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

A. BECK, *Chairman*.

(Seal.)

W. W. POPE, *Secretary*.

MUNICIPAL CORPORATION OF THE TOWN OF SMITH'S FALLS.

J. F. MONTGOMERY, *Mayor*.

(Seal.)

J. A. LEWIS, *Clerk*.



## SCHEDULE "I."

This Indenture, made in duplicate the 7th day of September, in the year of our Lord, 1917,

Between

The Hydro-Electric Power Commission of Ontario, hereinafter called the "Commission," party of the first part;

and

The Village of Beeton, located in Simcoe County, Ontario, hereinafter called the "Corporation," party of the second part.

Whereas, pursuant to an Act to provide for the Transmission of Electrical Power to Municipalities, known as the *Power Commission Act* and amendments thereto, the Corporation applied to the Commission for a supply of power, and the Commission furnished the Corporation with estimates of the total cost of such power, ready for distribution within the limits of the Corporation (and the electors of the Corporation consented to the By-law No. 358 authorizing the Corporation to enter into a contract with the Commission for such power).

1. Now, therefore, this indenture witnesseth that in consideration of the premises and of the agreement of the Corporation herein set forth, subject to the provisions of the said Act and amendments thereto, the Commission agrees with the Corporation:

(a) To reserve and deliver at the earliest possible date one hundred and twenty-five horse power (125 h.p.) or more of electrical power to the Corporation.

(b) At the expiration of reasonable notice in writing, which may be given by the Corporation from time to time during the continuance of this agreement, to reserve and deliver to the Corporation additional electric power when called for.

(c) To use at all times first-class, modern, standard commercial apparatus and plant, and to exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Corporation.

(d) To deliver commercially continuous twenty-four (24) hour power every day in the year to the Corporation at the distribution bus bars in the Commission's substation within the Corporation's limits.

2. In consideration of the premises and of the agreements herein set forth, the Corporation agrees with the Commission:

(a) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power dealt with by this agreement so as to be able to receive power when the Commission is ready to deliver same.

(b) To pay annually, interest at rate payable by the Commission upon the Corporation's proportionate part (based on the quantity of electrical energy or power taken) of all moneys expended by the Commission on capital account for the acquiring of properties and rights, the acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations and other works necessary for the delivery of said electrical energy or power to the Corporation under the terms of this contract.

Also to pay an annual sinking fund instalment of such amount as to form at the end of thirty (30) years, with accrued interest, a sinking fund sufficient to repay the Corporation's proportionate part, based as aforesaid, of all moneys advanced by the Province of Ontario for the acquiring of properties and rights, the acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations and other work necessary for the delivery of said electrical energy or power, delivered to the Corporation under the terms of this contract. Also to pay the Corporation's proportionate part, based as aforesaid, of the cost of lost power and the cost of operating, maintaining, repairing, renewing and insuring said generating plants, transformer stations, transmission lines, distributing stations and other necessary works. Subject to adjustment under clause 6 of this agreement.

(c) The accounts payable under this contract shall be paid in twelve monthly payments, in gold coin of the present standard of weight and fineness, at the offices of the Commission at Toronto. Bills shall be rendered by the Commission on or before the fifth day and paid by the Corporation on or before the fifteenth day of each month. If any bill remains unpaid for fifteen days the Commission may, in addition to all other remedies and without notice, discontinue the supply of power to the Corporation until said bill is paid. No such discontinuance shall relieve the Corporation from the performance of the covenants, provisos and conditions herein contained. All payments in arrears shall bear interest at the legal rate.

(d) To take electric power exclusively from the Commission during the continuance of this agreement.

(e) To co-operate by all means in its power at all times with the Commission to increase the quantity of power required from the Commission, and in all other respects to carry out the object of this agreement and of the said Act.

(f) To pay for three-fourths of the power ordered from time to time by the Corporation and held in reserve for it as herein provided whether it takes the same or not. When the highest average amount of power taken for any twenty (20) consecutive minutes during any month shall exceed during the twenty (20) consecutive minutes three-fourths of the amount ordered by the Corporation and held in reserve, then the Corporation shall pay for this greater amount during the entire month.

(g) If the Corporation during any month takes more than the amount of power ordered and held in reserve for it, as determined by an integrated peak, or highest average, for a period of twenty (20) consecutive minutes, the taking of such excess shall thereafter constitute an obligation on the part of the Corporation to pay for, and on the part of the Commission to hold in reserve, such increased quantity of power in accordance with the terms and conditions of this contract.

(h) When the power factor of the highest average amount of power taken for said twenty (20) consecutive minutes falls below ninety per cent. (90%) the Corporation shall pay for ninety per cent. (90%) of the kilovolt amperes, providing that said ninety per cent. (90%) of said kilovolt amperes is greater than the maximum kilowatts for any twenty (20) minutes period during the month.

(i) To use at all times first-class, modern, standard, commercial apparatus and plant, to be approved by the Commission.

(j) To exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Commission and of the Corporation.

3. This agreement shall remain in force for thirty (30) years from date of the first delivery of power under this contract.

4. The power shall be alternating, three-phase, having a periodicity of approximately sixty (60) cycles per second and shall be delivered at a voltage suitable for local distribution.

(a) The meters with their series and potential transformers shall be connected at the point of delivery.

(b) The maintenance by the Commission of approximately the agreed voltage at approximately the agreed frequency at the sub-station in the limits of the Corporation shall constitute the supply of all power involved herein and the fulfilment of all operating obligations hereunder, and when voltage and frequency are so maintained, the amount of power, its fluctuations, load factor, power factor, distribution as to phases and all other electric characteristics and qualities are under the sole control of the Corporation, their agents, customers, apparatus, appliances and circuits.

5. The Engineers of the Commission, or one or more of them, or any other person or persons appointed for this purpose by the Commission, shall have the right from time to time during the continuance of this agreement to inspect the apparatus, plant and property of the Corporation and take records at all reasonable hours.

6. The Commission shall, at least annually, adjust and apportion the amount or amounts payable by the Municipal Corporation or Corporations for such power and such interest, sinking fund, cost of lost power and cost of generating, operating, maintaining, repairing, renewing and insuring said works.

If at any time any other Municipal Corporation, or pursuant to said Act, any railway or distributing company, or any other Corporation or person, applies to the Commission for a supply of power, the Commission shall notify the applicant and the involved Corporation or Corporations in writing, of a time and place to hear all representations that may be made as to the terms and conditions for such supply.

Without discrimination in favour of the applicants as to the price to be paid, for equal quantities of power, the Commission may supply power upon such terms and conditions as may, having regard to the risk and expense incurred, and paid, and to be paid by the Corporation, appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.



No such application shall be granted if the said works or any part thereof are not adequate for such supply, or if the supply of the Corporation will be thereby injuriously affected, and no power shall be supplied within the limits of a Municipal Corporation taking power from the Commission at the time such application is made, without the written consent of such Corporation.

In determining the quantity of power supplied to a Municipal Corporation, the quantity supplied by the Commission within the limits of the Corporation to any applicant, other than a Municipal Corporation, shall be computed as part of the quantity supplied to such Corporation, but such Corporation shall not be liable for payment for any portion of the power so supplied. No power shall be supplied by the Municipal Corporation to any railway or distributing company without the written consent of the Commission. Power shall not be sold for less than the cost, and there shall be no discrimination as regards price and quantity.

7. It is hereby declared that the Commission is to be a trustee of all property held by the Commission under this agreement for the Corporation or Corporations supplied by the Commission, but the Commission shall be entitled to a lien upon said property for all moneys expended by the Commission under this agreement and not repaid. At the expiration of this agreement the Commission shall determine and adjust the rights of the Corporation and any other (if any) supplied by the Commission, having regard to the amounts paid by them respectively under the terms of this agreement, and such other considerations as may appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

8. If differences arise between Corporations to which the Commission is supplying power, the Commission may, upon application, fix a time and place and hear all representations that may be made by the parties, and the Commission shall, in a summary manner, when possible, adjust such differences, and such adjustment shall be final. The Commission shall have all the powers that may be conferred upon a Commission or appointed under the *Act Respecting Enquiries Concerning Public Matters*.

9. This agreement shall extend to, be binding upon, and enure to the benefit of the successors and assigns of the parties hereto.

In witness whereof the Commission and the Corporation have respectively affixed their corporate seals and the hands of their proper officers.

#### HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

A. BECK, *Chairman*.

(SEAL.)

W. W. POPE, *Secretary*.

#### VILLAGE OF BEETON.

W. T. STEWART, *Reeve*.

(SEAL.)

JOSEPH WRIGHT, *Clerk*.

## SCHEDULE "J."

This Indenture, made in duplicate the 14th day of September, in the year of our Lord, one thousand nine hundred and seventeen (1917),

Between

The Hydro-Electric Power Commission of Ontario, hereinafter called the "Commission," party of the first part;

and

The Municipal Corporation of the Village of Bloomfield, hereinafter called the "Corporation," party of the second part.

Whereas the Corporation, under the provisions of *The Power Commission Act* and amendments thereto, Revised Statutes of Ontario, Chapter 39, has applied to the Commission for a supply of power and has passed a By-law No. 265, passed the 30th day of July, 1915, to authorize the execution of an agreement therefor.

Now therefore this indenture witnesseth that in consideration of the premises and of the agreement of the Corporation herein set forth, subject to the provisions of the said Act and amendments thereto, the parties hereto agree each with the other as follows:

1. The Commission agrees:—

(a) To reserve and deliver at the earliest possible date fifty (50) horsepower, or more, of electrical power to the Corporation.

(b) At the expiration of reasonable notice, in writing, which may be given by the Corporation from time to time during the continuance of this agreement, to reserve and deliver to the Corporation additional electric power when called for.

(c) To use at all times first-class, modern, standard commercial apparatus and plant, and to exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Corporation.

(d) To deliver commercially continuous twenty-four (24) hour power every day in the year to the Corporation at the distribution bus bars in the Commission's sub-station within the Corporation's limits.

2. The Corporation agrees:—

(a) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power dealt with by this agreement so as to be able to receive power when the Commission is ready to deliver same.

(b) To pay annually in twelve (12) equal monthly instalments interest upon its proportionate part (based on the quantity of electrical energy or power taken) of all moneys expended by the Commission on capital account

for the acquiring of properties and rights, the acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations, and other works necessary for the delivery of said electrical energy or power to the Corporation under the terms of this contract.

To pay an annual sum for its proportionate part of all moneys expended by the Commission on capital account for the acquiring of the said properties and rights, and the cost of the said construction, so as to form in thirty (30) years a sinking fund for the retirement of securities issued by the Province of Ontario.

Also to bear its proportionate part of the line loss and pay its proportionate part of the cost to operate, maintain, repair, renew, and insure the said generating plants, transformer stations, transmission lines, distributing stations, and other necessary works.

All payments under this clause shall be subject to adjustment under paragraph 6.

(c) The amounts payable in accordance with clause 2 (b) shall be paid in gold coin of the present standard of weight and fineness, at the offices of the Commission at Toronto. Bills shall be rendered by the Commission on or before the 5th day and paid by the Corporation on or before the 15th day of each month. If any bills remain unpaid for fifteen days the Commission may, in addition to all other remedies and without notice, discontinue the supply of power to the Corporation until said bill is paid. No such discontinuance shall relieve the Corporation from the performance of the covenants, provisoes and conditions herein contained. All payments in arrears shall bear interest at the legal rate.

(d) To take electric power exclusively from the Commission during the continuance of this agreement.

(e) To pay for three-fourths of the power ordered from time to time by the Corporation and held in reserve for it as herein provided whether it takes the same or not. When the highest average amount of power taken for any twenty consecutive minutes during any month exceeds during the twenty consecutive minutes three-fourths of the amount ordered by the Corporation and held in reserve, then the Corporation shall pay for this greater amount during the entire month.

If the Corporation during any month takes more than the amount of power ordered and held in reserve for it, as determined by an integrated peak, or the highest average, for a period of twenty consecutive minutes, the taking of such excess shall thereafter constitute an obligation on the part of the Corporation to pay for, and on the part of the Commission to hold in reserve, such increased quantity of power in accordance with the terms and conditions of this contract.

When the power factor of the highest average amount of power taken for said twenty consecutive minutes falls below 90 per cent., the Corporation shall pay for 90 per cent. of the kilovolt amperes, provided that the said ninety per cent. (90%) of said kilovolt amperes is greater than the maximum kilowatts for any twenty (20) minute period during the month.



(f) To use at all times first-class, modern, standard commercial apparatus and plant, to be approved by the Commission, and to exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Commission and of the Corporation.

(g) To co-operate by all means in its power at all times with the Commission to increase the quantity of power required from the Commission, and in all other respects to carry out the objects of this agreement, and of the said Act.

3. This agreement shall remain in force for thirty (30) years from date of the first delivery of power under this contract.

4. The power shall be alternating, three-phase, having a periodicity of of approximately 60 cycles per second, and shall be delivered as aforesaid at a voltage suitable for local distribution.

5. The Engineers of the Commission, or one or more of them, or any other person or persons appointed for this purpose by the Commission, shall have the right from time to time during the continuance of this agreement to inspect the apparatus, plant and property of the Corporation and take records at all reasonable hours.

6. The Commission shall, at least annually, adjust and apportion the amount or amounts payable by the Municipal Corporation or Corporations for such power and such interest, sinking fund, cost of lost power and cost of generating, operating, maintaining, repairing, renewing and insuring said works.

7. It is hereby declared that the Commission is to be a trustee of all property held by the Commission under this agreement for the Corporations and other Municipal Corporations supplied by the Commission, but the Commission shall be entitled to a lien upon said property for all moneys expended by the Commission under this agreement and not repaid. At the expiration of this agreement the Commission shall determine and adjust the rights of the Corporations and other Municipal Corporations, supplied by the Commission, having regard to the amounts paid by them, respectively, under the terms of this agreement, and such other considerations as may appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

8. If at any time any other Municipal Corporation, or pursuant to said Act, any railway or distributing company, or any other Corporation or person, applies to the Commission for a supply of power, the Commission shall notify the applicant and the Corporation, in writing, of a time and place to hear all representations that may be made as to the terms and conditions for such supply.

Without discrimination in favour of the applicants as to the price to be paid, for equal quantities of power, the Commission may supply power upon such terms and conditions as may, having regard to the risk and expense incurred, and paid, and to be paid by the Corporation, appear equitable to the Commission, and are approved by the Lieutenant-Governor in Council.

No such application shall be granted if the said works or any part thereof are not adequate for such supply, or if the supply of the Corporation will be thereby injuriously affected, and no power shall be supplied within the limits of a Municipal Corporation taking power from the Commission at the time such application is made, without the written consent of such Corporation.

In determining the quantity of power supplied to a Municipal Corporation, the quantity supplied by the Commission within the limits of the Corporation to any applicant, other than a Municipal Corporation, shall be computed as part of the quantity supplied to such Corporation, but such Corporation shall not be liable for payment for any portion of the power so supplied. No power shall be supplied by the Municipal Corporation to any railway or distributing company without the written consent of the Commission, but the Corporation may sell power to any person or persons, or manufacturing companies within the limits of the Corporation, but such power shall not be sold for less than cost; neither shall there be any discrimination as regards price and quantity.

9. If differences arise between Corporations to which the Commission is supplying power, the Commission may, upon application, fix a time and place and hear all representations that may be made by the parties, and the Commission shall, in a summary manner, when possible, adjust such differences, and such adjustment shall be final. The Commission shall have all the powers that may be conferred upon a commissioner appointed under the *Act respecting Enquiries concerning Public Matters*.

10. This agreement shall extend to, be binding upon, and enure to the benefit of the successors and assigns of the parties hereto.

In witness whereof the Commission and the Corporation have respectively affixed their corporate seals and the hands of their proper officers.

HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

A. BECK, *Chairman*.

(SEAL.)

W. W. POPE, *Secretary*.

MUNICIPAL CORPORATION OF THE VILLAGE OF BLOOMFIELD.

S. EDGAR MASTEN, *Reeve*.

(SEAL.)

CHARLES H. TAYLOR, *Clerk*.

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## SCHEDULE "K."

This indenture made in duplicate the 8th day of December, in the year of our Lord 1917.

Between

The Hydro-Electric Power Commission of Ontario, hereinafter called the "Commission," party of the first part;

and

The Town of Bradford, located in Simcoe County, Ontario, hereinafter called the "Corporation," party of the second part.

Whereas pursuant to an Act to provide for the Transmission of Electrical Power to Municipalities, known as the *Power Commission Act* and amendments thereto, the Corporation applied to the Commission for a supply of power, and the Commission furnished the Corporation with estimates of the total cost of such power, ready for distribution within the limits of the Corporation (and the electors of the Corporation consented to the By-laws authorizing the Corporation to enter into a contract with the Commission for such power).

1. Now therefore this indenture witnesseth that in consideration of the premises and of the agreement of the Corporation herein set forth, subject to the provisions of the said Act and Amendments thereto, the Commission agrees with the Corporation:

(a) To reserve and deliver at the earliest possible date two hundred horse-power (200 h.p.) or more of electrical power to the Corporation.

(b) At the expiration of reasonable notice in writing, which may be given by the Corporation from time to time during the continuance of this agreement, to reserve and deliver to the Corporation additional electric power when called for.

(c) To use at all times first-class, modern, standard commercial apparatus and plant, and to exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Corporation.

(d) To deliver commercially continuous twenty-four (24) hour power every day in the year to the Corporation at the distribution bus bars in the Commission's sub-station within the Corporation's limits.

2. In consideration of the premises and of the agreements herein set forth, the Corporation agrees with the Commission:

(a) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power dealt with by this agreement so as to be able to receive power when the Commission is ready to deliver same.

(b) To pay annually, interest at rate payable by the Commission upon the Corporation's proportionate part (based on the quantity of electrical energy or power taken), of all moneys expended by the Commission on



capital account for the acquiring of properties and rights, the acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations and other works necessary for the delivery of said electrical energy or power to the Corporation under the terms of this contract.

Also to pay an annual sinking fund instalment of such amount as to form at the end of thirty (30) years, with accrued interest, a sinking fund sufficient to repay the Corporation's proportionate part, based as aforesaid, of all moneys advanced by the Province of Ontario for the acquiring of properties and rights, the acquiring and construction of generating plants, transformer stations transmission lines, distributing stations and other work necessary for the delivery of said electrical energy or power, delivered to the Corporation under the terms of this contract. Also to pay the Corporation's proportionate part, based as aforesaid, of the cost of lost power and of the cost of operating, maintaining, repairing, renewing and insuring said generating plants, transformer stations, transmission lines, distributing stations and other necessary works. Subject to adjustment under Clause 6 of this agreement.

(c) The amounts payable under this contract shall be paid in twelve monthly payments, in gold coin of the present standard of weight and fineness, at the offices of the Commission at Toronto. Bills shall be rendered by the Commission on or before the fifth day and paid by the Corporation on or before the fifteenth day of each month. If any bill remains unpaid for fifteen days the Commission may, in addition to all other remedies and without notice, discontinue the supply of power to the Corporation until said bill is paid. No such discontinuance shall relieve the Corporation from the performance of the covenants, provisos and conditions herein contained. All payments in arrears shall bear interest at the legal rate.

(d) To take electric power exclusively from the Commission during the continuance of this agreement.

(e) To co-operate by all means in its power, at all times with the Commission to increase the quantity of power required from the Commission, and in all other respects to carry out the object of this agreement and of the said Act.

(f) To pay for three fourths of the power ordered from time to time by the Corporation and held in reserve for it as herein provided whether it takes the same or not. When the highest average amount of power taken for any twenty (20) consecutive minutes during any month shall exceed during the twenty (20) consecutive minutes three-fourths of the amount ordered by the Corporation and held in reserve, then the Corporation shall pay for this greater amount during the entire month.

(g) If the Corporation during any month takes more than the amount of power ordered and held in reserve for it, as determined by an integrated peak, or highest average, for a period of twenty (20) consecutive minutes, the taking of such excess shall thereafter constitute an obligation on the part of the Corporation to pay for, and on the part of the Commission to hold in reserve, such increased quantity of power in accordance with the terms and conditions of this contract.

(h) When the power factor of the highest average amount of power taken for said twenty (20) consecutive minutes falls below ninety per cent. (90%) the Corporation shall pay for ninety per cent. (90%) of the kilovolt amperes, providing that said ninety per cent. (90%) of said kilovolt amperes is greater than the maximum kilowatts for any twenty (20) minute period during the month.

(i) To use at all times first-class, modern, standard, commercial apparatus and plant, to be approved by the Commission.

(j) To exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Commission and of the Corporation.

3. This agreement shall remain in force for thirty (30) years from date of the first delivery of power under this contract.

4. The power shall be alternating, three-phase, having a periodicity of approximately sixty (60) cycles per second and shall be delivered at a voltage suitable for local distribution.

(a) The meters with their series and potential transformers shall be connected at the point of delivery.

(b) The maintenance by the Commission of approximately the agreed voltage at approximately the agreed frequency at the sub-station in the limits of the Corporation shall constitute the supply of all power involved herein and the fulfilment of all operating obligations hereunder, and when voltage and frequency are so maintained, the amount of power, its fluctuations, load factor, power factor, distribution as to phases and all other electric characteristics and qualities are under the sole control of the Corporation, their agents, customers, apparatus, appliances and circuits.

5. The Engineers of the Commission, or one or more of them, or any other person or persons appointed for this purpose by the Commission, shall have the right from time to time during the continuance of this agreement to inspect the apparatus, plant and property of the Corporation and take records at all reasonable hours.

6. The Commission shall, at least annually, adjust and apportion the amount or amounts payable by the Municipal Corporation or Corporations for such power and such interest, sinking fund, cost of lost power and cost of generating, operating, maintaining, repairing, renewing and insuring said works.

If at any time any other Municipal Corporation, or pursuant to said Act, any railway or distributing company, or any other Corporation or person, applies to the Commission for a supply of power, the Commission shall notify the applicant and the involved Corporation or Corporations in writing, of a time and place to hear all representations that may be made as to the terms and conditions for such supply.

Without discrimination in favour of the applicants as to the price to be paid, for equal quantities of power, the Commission may supply power upon such terms and conditions as may, having regard to the risk and expense incurred, and paid, and to be paid by the Corporation, appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

No such application shall be granted if the said works or any part thereof are not adequate for such supply, or if the supply of the Corporation will be thereby injuriously affected, and no power shall be supplied within the limits of a Municipal Corporation taking power from the Commission at the time such application is made, without the written consent of such Corporation.

In determining the quantity of power supplied to a Municipal Corporation, the quantity supplied by the Commission within the limits of the Corporation to any applicant, other than a Municipal Corporation, shall be computed as part of the quantity supplied to such Corporation, but such Corporation shall not be liable for payment for any portion of the power so supplied. No power shall be supplied by the Municipal Corporation to any railway or distributing company without the written consent of the Commission. Power shall not be sold for less than the cost, and there shall be no discrimination as regards price and quantity.

7. It is hereby declared that the Commission is to be a trustee of all property held by the Commission under this agreement for the Corporation or Corporations supplied by the Commission, but the Commission shall be entitled to a lien upon said property for all moneys expended by the Commission under this agreement and not repaid. At the expiration of this agreement the Commission shall determine and adjust the rights of the Corporation and any other (if any) supplied by the Commission, having regard to the amounts paid by them respectively under the terms of this agreement, and such other considerations as may appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

8. If differences arise between Corporations to which the Commission is supplying power, the Commission may, upon application, fix a time and place and hear all representations that may be made by the parties, and the Commission shall, in a summary manner, when possible, adjust such differences, and such adjustment shall be final. The Commission shall have all the powers that may be conferred upon a Commission or appointed under the *Act respecting Enquiries concerning Public Matters*.

9. This agreement shall extend to, be binding upon, and enure to the benefit of the successors and assigns of the parties hereto.

In witness whereof the Commission and the Corporation have respectively affixed their corporate seals and the hands of their proper officers.

#### HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

A. BECK, *Chairman*.

(SEAL.)

W. W. POPE, *Secretary*.

#### TOWN OF BRADFORD.

A. E. SCANLON, *Mayor*.

(SEAL.)

GEO. G. GREEN, *Clerk*.

## SCHEDULE "L."

This Indenture made in duplicate the 10th day of September in the year of our Lord 1917.

Between

The Hydro-Electric Power Commission of Ontario, hereinafter called the "Commission," party of the first part;

and

The Police Village of Cookstown, located in Innisfil, Essa, Tecumseh and West Gwillimbury Townships, Simcoe County, Ontario, hereinafter called the "Corporation," party of the second part.

Whereas, pursuant to an Act to provide for the transmission of electrical power to municipalities, known as the *Power Commission Act* and amendments thereto, the Corporation applied to the Commission for a supply of power, and the Commission furnished the Corporation, with estimates of the total cost of such power, ready for distribution within the limits of the Corporation (and the electors of the Corporation consented to the By-law No. 21, authorizing the Corporation to enter into a contract with the Commission for such power).

1. Now, therefore, this indenture witnesseth that in consideration of the premises and of the agreement of the Corporation herein set forth subject to the provisions of the said Act and amendments thereto, the Commission agrees with the Corporation:

(a) To reserve and deliver at the earliest possible date, seventy-five horsepower (75 h.p.) or more of electrical power to the Corporation.

(b) At the expiration of reasonable notice in writing which may be given by the Corporation from time to time during the continuance of this agreement, to reserve and deliver to the Corporation additional electric power when called for.

(c) To use at all times first-class, modern, standard, commercial apparatus and plant, and to exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Corporation.

(d) To deliver commercially continuous twenty-four (24) hour power every day in the year to the Corporation at the distribution bus bars in the Commission's sub-station within the Corporation's limits.

2. In consideration of the premises and of the agreements herein set forth, the Corporation agrees with the Commission:

(a) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power dealt with by this agreement so as to be able to receive power when the Commission is ready to deliver same.

(b) To pay annually, interest at rate payable by the Commission upon the Corporation's proportionate part (based on the quantity of electrical



energy or power taken) of all moneys expended by the Commission on capital account for the acquiring of properties and rights, the acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations and other works necessary for the delivery of said electrical energy or power to the Corporation under the terms of this contract.

Also to pay an annual sinking fund instalment of such amount as to form at the end of thirty (30) years, with accrued interest, a sinking fund sufficient to repay the Corporation's proportionate part, based as aforesaid, of all moneys advanced by the Province of Ontario for the acquiring of properties and rights, the acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations and other work necessary for the delivery of said electrical energy or power, delivered to the Corporation under the terms of this contract. Also to pay the Corporation's proportionate part, based as aforesaid, of the cost of lost power and of the cost of operating, maintaining, repairing, renewing and insuring said generating plants, transformer stations, transmission lines, distributing stations and other necessary works. Subject to adjustment under clause 6 of this agreement.

(c) The amounts payable under this contract shall be paid in twelve monthly payments, in gold coin of the present standard of weight and fineness, at the offices of the Commission at Toronto. Bills shall be rendered by the Commission on or before the fifth day and paid by the Corporation on or before the fifteenth day of each month. If any bill remains unpaid for fifteen days the Commission may, in addition to all other remedies and without notice, discontinue the supply of power to the Corporation until said bill is paid. No such discontinuance shall relieve the Corporation from the performance of the covenants, provisoes and conditions herein contained. All payments in arrears shall bear interest at the legal rate.

(d) To take electric power exclusively from the Commission during the continuance of this agreement.

(e) To co-operate by all means in its power at all times with the Commission to increase the quantity of power required from the Commission, and in all other respects to carry out the objects of this agreement and of the said Act.

(f) To pay for three-fourths of the power ordered from time to time by the Corporation and held in reserve for it as herein provided whether it takes the same or not. When the highest average amount of power taken for any twenty (20) consecutive minutes during any month shall exceed during the twenty (20) consecutive minutes three-fourths of the amount ordered by the Corporation and held in reserve, then the Corporation shall pay for this greater amount during the entire month.

(g) If the Corporation during any month takes more than the amount of power ordered and held in reserve for it, as determined by an integrated peak, or highest average, for a period of twenty (20) consecutive minutes, the taking of such excess shall thereafter constitute an obligation on the part of the Corporation to pay for, and on the part of the Commission to hold in reserve, such increased quantity of power in accordance with the terms and conditions of this contract.

(h) When the power factor of the highest average amount of power taken for said twenty (20) consecutive minutes falls below ninety per cent. (90%) the Corporation shall pay for ninety per cent. (90%) of the kilovolt amperes, providing that said ninety per cent. (90%) of said kilovolt amperes is greater than the maximum kilowatts for any twenty (20) minute period during the month.

(i) To use at all times first-class, modern, standard, commercial apparatus and plant, to be approved by the Commission.

(j) To exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Commission and of the Corporation.

3. This agreement shall remain in force for thirty (30) years from the date of the first delivery of power under this contract.

4. The power shall be alternating, three-phase, having a periodicity of approximately sixty (60) cycles per second, and shall be delivered at a voltage suitable for local distribution.

(a) The meters, with their series and potential transformers shall be connected at the point of delivery.

(b) The maintenance by the Commission of approximately the agreed voltage at approximately the agreed frequency at the sub-station in the limits of the Corporation shall constitute the supply of all power involved herein and the fulfilment of all operating obligations hereunder, and when voltage and frequency are so maintained, the amount of power, its fluctuations, load factor, power factor, distribution as to phases and all other electric characteristics and qualities, are under the sole control of the Corporation, their agents, customers, apparatus, appliances and circuits.

5. The Engineers of the Commission, or one or more of them, or any other person or persons appointed for this purpose by the Commission, shall have the right from time to time during the continuance of this agreement to inspect the apparatus, plant and property of the Corporation and take records at all reasonable hours.

6. The Commission shall, at least annually, adjust and apportion the amount or amounts payable by the Municipal Corporation or Corporations for such power and such interest, sinking fund, cost of lost power and cost of generating, operating, maintaining, repairing, renewing and insuring said works.

If at any time any other Municipal Corporation, or pursuant to said Act, any railway or distributing company, or any other Corporation or person, applies to the Commission for a supply of power, the Commission shall notify the applicant and the involved Corporation or Corporations in writing of a time and place to hear all representations that may be made as to the terms and conditions for such supply.

Without discrimination in favour of the applicants as to the price to be paid for equal quantities of power, the Commission may supply power upon such terms and conditions as may, having regard to the risk and expense incurred, and paid, and to be paid by the Corporation, appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

No such application shall be granted if the said works or any part thereof are not adequate for such supply, or if the supply of the Corporation will be thereby injuriously affected, and no power shall be supplied within the limits of a Municipal Corporation taking power from the Commission at the time such application is made, without the written consent of such Corporation.

In determining the quantity of power supplied to a Municipal Corporation, the quantity supplied by the Commission within the limits of the Corporation to any applicant, other than a Municipal Corporation, shall be computed as part of the quantity supplied to such Corporation, but such Corporation shall not be liable for payment for any portion of the power so supplied. No power shall be supplied by the Municipal Corporation to any railway or distributing company without the written consent of the Commission. Power shall not be sold for less than the cost, and there shall be no discrimination as regards price and quantity.

7. It is hereby declared that the Commission is to be a trustee of all property held by the Commission under this agreement for the Corporation or Corporations supplied by the Commission, but the Commission shall be entitled to a lien upon said property for all moneys expended by the Commission under this agreement and not repaid. At the expiration of this agreement the Commission shall determine and adjust the rights of the Corporation and any other (if any) supplied by the Commission, having regard to the amounts paid by them respectively under the terms of this agreement, and such other considerations as may appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

8. If differences arise between Corporations to which the Commission is supplying power, the Commission may, upon application, fix a time and place and hear all representations that may be made by the parties, and the Commission shall, in a summary manner when possible, adjust such differences, and such adjustment shall be final. The Commission shall have all the powers that may be conferred upon a Commissioner appointed under the *Act respecting Enquiries concerning Public Matters*.

9. This agreement shall extend to, be binding upon, and enure to the benefit of the successors and assigns of the parties hereto.

In witness whereof the Commission and the Corporation have respectively affixed their corporate seals and the hands of their proper officers.

#### HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

A. BECK, *Chairman*.

(SEAL.)

W. W. POPE, *Secretary*.

#### THE POLICE VILLAGE OF COOKSTOWN.

H. L. DUNNING.

F. H. ROBINSON.

(SEAL.)

C. H. CAMPBELL.

## SCHEDULE "M."

This indenture made in duplicate the 16th day of October, in the year of our Lord 1917.

Between

The Hydro-Electric Power Commission of Ontario, hereinafter called the "Commission," party of the first part;

and

The Village of Tottenham, located in Simcoe County, Ontario, hereinafter called the "Corporation," party of the second part.

Whereas, pursuant to an Act to provide for the transmission of electrical power to municipalities, known as the *Power Commission Act* and amendments thereto, the Corporation applied to the Commission for a supply of power, and the Commission furnished the Corporation with estimates of the total cost of such power, ready for distribution within the limits of the Corporation (and the electors of the Corporation consented to By-law No 258, authorizing the Corporation to enter into a contract with the Commission for such power):

1. Now, therefore, this indenture witnesseth that in consideration of the premises and of the agreement of the Corporation herein set forth subject to the provisions of the said Act and amendments thereto, the Commission agrees with the Corporation:

(a) To reserve and deliver at the earliest possible date one hundred and twenty-five horse-power (125 h.p.) or more of electrical power to the Corporation.

(b) At the expiration of reasonable notice in writing which may be given by the Corporation from time to time during the continuance of this agreement, to reserve and deliver to the Corporation additional electric power when called for.

(c) To use at all times first-class, modern, standard, commercial apparatus and plant, and to exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Corporation.

(d) To deliver commercially continuous twenty-four (24) hour power every day in the year to the Corporation at the distribution bus bars in the Commission's sub-station within the Corporation's limits.

2. In consideration of the premises and of the agreements herein set forth, the Corporation agrees with the Commission:

(a) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power dealt with by this agreement so as to be able to receive power when the Commission is ready to deliver same.

(b) To pay annually, interest at rate payable by the Commission upon the Corporation's proportionate part (based on the quantity of electrical



energy or power taken) of all moneys expended by the Commission on capital account for the acquiring of properties and rights, the acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations and other works necessary for the delivery of said electrical energy or power to the Corporation under the terms of this contract.

Also to pay an annual sinking fund instalment of such amount as to form at the end of thirty (30) years, with accrued interest, a sinking fund sufficient to repay the Corporation's proportionate part, based as aforesaid, of all moneys advanced by the Province of Ontario for the acquiring of properties and rights, the acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations and other work necessary for the delivery of said electrical energy or power, delivered to the Corporation under the terms of this contract. Also to pay the Corporation's proportionate part, based as aforesaid, of the cost of lost power and of the cost of operating, maintaining, repairing, renewing and insuring said generating plants, transformer stations, transmission lines, distributing stations and other necessary works. Subject to adjustment under clause 6 of this agreement.

(c) The amounts payable under this contract shall be paid in twelve monthly payments, in gold coin of the present standard of weight and fineness, at the offices of the Commission at Toronto. Bills shall be rendered by the Commission on or before the fifth day and paid by the Corporation on or before the fifteenth day of each month. If any bill remains unpaid for fifteen days the Commission may, in addition to all other remedies and without notice, discontinue the supply of power to the Corporation until said bill is paid. No such discontinuance shall relieve the Corporation from the performance of the covenants, provisos and conditions herein contained. All payments in arrears shall bear interest at the legal rate.

(d) To take electric power exclusively from the Commission during the continuance of this agreement.

(e) To co-operate by all means in its power at all times with the Commission to increase the quantity of power required from the Commission, and in all other respects to carry out the objects of this agreement and of the said Act.

(f) To pay for three-fourths of the power ordered from time to time by the Corporation and held in reserve for it as herein provided whether it takes the same or not. When the highest average amount of power taken for any twenty (20) consecutive minutes during any month shall exceed during the twenty (20) consecutive minutes three-fourths of the amount ordered by the Corporation and held in reserve, then the Corporation shall pay for this greater amount during the entire month.

(g) If the Corporation during any month takes more than the amount of power ordered and held in reserve for it, as determined by an integrated peak, or highest average, for a period of twenty (20) consecutive minutes, the taking of such excess shall thereafter constitute an obligation on the part of the Corporation to pay for, and on the part of the Commission to hold in reserve, such increased quantity of power in accordance with the terms and conditions of this contract.

(h) When the power factor of the highest average amount of power taken for said twenty (20) consecutive minutes falls below ninety per cent. (90%) the Corporation shall pay for ninety per cent. (90%) of the kilovolt amperes, providing that said ninety per cent. (90%) of said kilovolt amperes is greater than the maximum kilowatts for any twenty (20) minute period during the month.

(i) To use at all times first-class, modern, standard, commercial apparatus and plant, to be approved by the Commission.

(j) To exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Commission and of the Corporation.

3. This agreement shall remain in force for thirty (30) years from the date of the first delivery of power under this contract.

4. The power shall be alternating, three-phase, having a periodicity of approximately sixty (60) cycles per second, and shall be delivered at a voltage suitable for local distribution.

(a) The meters, with their series and potential transformers shall be connected at the point of delivery.

(b) The maintenance by the Commission of approximately the agreed voltage at approximately the agreed frequency at the sub-station in the limits of the Corporation shall constitute the supply of all power involved herein and the fulfilment of all operating obligations hereunder, and when voltage and frequency are so maintained, the amount of power, its fluctuations, load factor, power factor, distribution as to phases and all other electric characteristics and qualities, are under the sole control of the Corporation, their agents, customers, apparatus, appliances and circuits.

5. The Engineers of the Commission, or one or more of them, or any other person or persons appointed for this purpose by the Commission, shall have the right from time to time during the continuance of this agreement to inspect the apparatus, plant and property of the Corporation and take records at all reasonable hours.

6. The Commission shall, at least annually, adjust and apportion the amount or amounts payable by the Municipal Corporation or Corporations for such power and such interest, sinking fund, cost of lost power and cost of generating, operating, maintaining, repairing, renewing and insuring said works.

If at any time any other Municipal Corporation, or pursuant to said Act, any railway or distributing company, or any other Corporation or person, applies to the Commission for a supply of power, the Commission shall notify the applicant and the involved Corporation or Corporations in writing of a time and place to hear all representations that may be made as to the terms and conditions for such supply.

Without discrimination in favour of the applicants as to the price to be paid for equal quantities of power, the Commission may supply power upon such terms and conditions as may, having regard to the risk and expense

incurred, and paid, and to be paid by the Corporation, appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

No such application shall be granted if the said works or any part thereof are not adequate for such supply, or if the supply of the Corporation will be thereby injuriously affected, and no power shall be supplied within the limits of a Municipal Corporation taking power from the Commission at the time such application is made, without the written consent of such Corporation.

In determining the quantity of power supplied to a Municipal Corporation, the quantity supplied by the Commission within the limits of the Corporation to any applicant, other than a Municipal Corporation, shall be computed as part of the quantity supplied to such Corporation, but such Corporation shall not be liable for payment for any portion of the power so supplied. No power shall be supplied by the Municipal Corporation to any railway or distributing company without the written consent of the Commission. Power shall not be sold for less than the cost, and there shall be no discrimination as regards price and quantity.

7. It is hereby declared that the Commission is to be a trustee of all property held by the Commission under this agreement for the Corporation or Corporations supplied by the Commission, but the Commission shall be entitled to a lien upon said property for all moneys expended by the Commission under this agreement and not repaid. At the expiration of this agreement the Commission shall determine and adjust the rights of the Corporation and any other (if any) supplied by the Commission, having regard to the amounts paid by them respectively under the terms of this agreement, and such other considerations as may appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

8. If differences arise between Corporations to which the Commission is supplying power, the Commission may, upon application, fix a time and place and hear all representations that may be made by the parties, and the Commission shall, in a summary manner when possible, adjust such differences, and such adjustment shall be final. The Commission shall have all the powers that may be conferred upon a Commissioner appointed under the *Act respecting Enquiries concerning Public Matters*.

9. This agreement shall extend to, be binding upon, and enure to the benefit of the successors and assigns of the parties hereto.

In witness whereof the Commission and the Corporation have respectively affixed their corporate seals and the hands of their proper officers.

#### HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

A. BECK, *Chairman*.

(SEAL.)

W. W. POPE, *Secretary*.

#### VILLAGE OF TOTTENHAM.

JOHN McCABE, *Clerk*.

(SEAL.)

JAMES McKNIGHT, *Reeve*.

## SCHEDULE "N."

This indenture, made in duplicate the 13th day of September, in the year of our Lord one thousand nine hundred and seventeen (1917).

Between:

The Hydro-Electric Power Commission of Ontario, hereinafter called the "Commission," party of the first part;

and

The Municipal Corporation of the Village of Wellington, hereinafter called the "Corporation," party of the second part.

Whereas the Corporation, under the provisions of *The Power Commission Act* and amendments thereto, Revised Statutes of Ontario, chapter 39, has applied to the Commission for a supply of power and has passed a By-law No. 265, passed the 30th day of July, 1915, to authorize the execution of an agreement therefor.

Now, therefore, this indenture witnesseth that in consideration of the premises and of the agreement of the Corporation herein set forth, subject to the provisions of the said Act and amendments thereto, the parties hereto agree each with the other as follows:

1. The Commission agrees:

(a) To reserve and deliver at the earliest possible date seventy-five (75) horse-power, or more, of electrical power to the Corporation.

(b) At the expiration of reasonable notice, in writing, which may be given by the Corporation from time to time during the continuance of this agreement, to reserve and deliver to the Corporation additional electric power when called for.

(c) To use at all times first-class, modern, standard, commercial apparatus and plant, and to exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Corporation.

(d) To deliver commercially continuous twenty-four (24) hour power every day in the year to the Corporation at the distribution bus bars in the Commission's sub-station within the Corporation's limits.

2. The Corporation agrees:

(a) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power dealt with by this agreement so as to be able to receive power when the Commission is ready to deliver same.

(b) To pay annually in twelve (12) equal monthly instalments, interest upon its proportionate part (based on the quantity of electrical energy or power taken), of all moneys expended by the Commission on capital account for the acquiring of properties and rights, the acquiring and construction of generating plants, transformer stations, transmission lines, distributing



stations, and other works necessary for the delivery of said electrical energy or power to the Corporation under the terms of this contract.

To pay an annual sum for its proportionate part of all moneys expended by the Commission on Capital account for the acquiring of the said properties and rights, and the cost of the said construction, so as to form in thirty (30) years a sinking fund for the retirement of securities issued by the Province of Ontario.

Also to bear its proportionate part of the line loss and pay its proportionate part of the cost to operate, maintain, repair, renew, and insure the said generating plants, transformer stations, transmission lines, distributing stations, and other necessary works.

All payments under this clause shall be subject to adjustment under paragraph 6.

(c) The amounts payable in accordance with clause 2 (b) shall be paid in gold coin of the present standard of weight and fineness, at the offices of the Commission at Toronto. Bills shall be rendered by the Commission on or before the 5th day and paid by the Corporation on or before the 15th day of each month. If any bills remain unpaid for fifteen days the Commission may, in addition to all other remedies and without notice, discontinue the supply of power to the Corporation until said bill is paid. No such discontinuance shall relieve the Corporation from the performance of the covenants, provisoes and conditions herein contained. All payments in arrears shall bear interest at the legal rate.

(d) To take electric power exclusively from the Commission during the continuance of this agreement.

(e) To pay for three-fourths of the power ordered from time to time by the Corporation and held in reserve for it as herein provided, whether it takes the same or not. When the highest average amount of power taken for any twenty consecutive minutes during any month exceeds during the twenty consecutive minutes three-fourths of the amount ordered by the Corporation and held in reserve, then the Corporation shall pay for this greater amount during the entire month.

If the Corporation during any month takes more than the amount of power ordered and held in reserve for it, as determined by an integrated peak, or the highest average, for a period of twenty consecutive minutes, the taking of such excess shall thereafter constitute an obligation on the part of the Corporation to pay for, and on the part of the Commission to hold in reserve, such increased quantity of power in accordance with the terms and conditions of this contract.

When the power factor of the highest average amount of power taken for said twenty consecutive minutes falls below 90 per cent., the Corporation shall pay for 90 per cent. of the kilovolt amperes provided that the said ninety per cent. (90%) of said kilovolt amperes is greater than the maximum kilowatts for any twenty (20) minute period during the month.

(f) To use at all times first-class, modern, standard commercial apparatus and plant, to be approved by the Commission, and to exercise all due skill and diligence so as to secure satisfactory operation of the plant and apparatus of the Commission and of the Corporation.

(g) To co-operate by all means in its power at all times with the Commission to increase the quantity of power required from the Commission, and in all other respects to carry out the objects of this agreement, and of the said Act.

3. This agreement shall remain in force for thirty (30) years from the date of the first delivery of power under this contract.

4. The power shall be alternating, three-phase, having a periodicity of approximately 60 cycles per second, and shall be delivered as aforesaid at a voltage suitable for local distribution.

5. The engineers of the Commission, or one or more of them, or any other persons or persons appointed for this purpose by the Commission, shall have the right from time to time, during the continuance of this agreement, to inspect the apparatus, plant and property of the Corporation, and take records at all reasonable hours.

6. The Commission shall at least annually adjust and apportion the amount or amounts payable by the Municipal Corporation or Corporations for such power and such interest, sinking fund, cost of lost power and cost of generating, operating, maintaining, repairing, renewing and insuring said works.

7. It is hereby declared that the Commission is to be a trustee of all property held by the Commission under this agreement for the Corporations and other Municipal Corporations supplied by the Commission, but the Commission shall be entitled to a lien upon said property for all moneys expended by the Commission under this agreement and not repaid. At the expiration of this agreement the Commission shall determine and adjust the rights of the Corporations and other Municipal Corporations, supplied by the Commission, having regard to the amount paid by them, respectively, under the terms of this agreement, and such other considerations as may appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

8. If at any time any other Municipal Corporation, or pursuant to said Act, any railway or distributing company, or any other Corporation or person, applies to the Commission for a supply of power, the Commission shall notify the applicant and the Corporation, in writing, of a time and place to hear all representations that may be made as to the terms and conditions for such supply.

Without discrimination in favor of the applicants as to the price to be paid, for equal quantities of power, the Commission may supply power upon such terms and conditions as may, having regard to the risk and expense incurred, and paid, and to be paid by the Corporation, appear equitable to the Commission, and are approved by the Lieutenant-Governor in Council.

No such application shall be granted if the said works, or any part thereof, are not adequate for such supply, or if the supply of the Corporation will be thereby injuriously affected, and no power shall be supplied within the limits of a Municipal Corporation taking power from the Commission at the time of such application, without the written consent of such Corporation.

In determining the quantity of power supplied to a Municipal Corporation, the quantity supplied by the Commission within the limits of the Corporation to any applicant, other than a Municipal Corporation, shall be computed as part of the quantity supplied to each Corporation, but such Corporation shall not be liable for payment for any portion of the power so supplied. No power shall be supplied by the Municipal Corporation to any railway or distributing company, without the written consent of the Commission, but the Corporation may sell power to any person or persons, or manufacturing companies within the limits of the Corporation, but such power shall not be sold for less than cost; neither shall there be any discrimination as regards price and quantity.

9. If differences arise between Corporations to which the Commission is supplying power, the Commission may, upon application, fix a time and place and hear all representations that may be made by the parties, and the Commission shall, in a summary manner, when possible, adjust such differences, and such adjustment shall be final. The Commission shall have all the powers that may be conferred upon a commissioner appointed under the *Act Respecting Enquiries Concerning Public Matters*.

10. This agreement shall extend to, be binding upon, and enure to the benefit of the successors and assigns of the parties hereto.

In witness whereof, the Commission and the Corporation have respectively affixed their Corporate Seals and the hands of their proper officers.

#### HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

A. BECK, *Chairman*.

(SEAL.)

W. W. POPE, *Secretary*.

#### MUNICIPAL CORPORATION OF THE VILLAGE OF WELLINGTON.

M. B. CLARKE, *Reeve*.

(SEAL.)

E. A. TITUS, *Clerk*,

#### SCHEDULE "O."

This Indenture made in duplicate the 4th day of April, in the year of our Lord, one thousand nine hundred and seventeen (1917),

Between

The Hydro-Electric Power Commission of Ontario, hereinafter called the "Commission," party of the first part;

and

The Municipal Corporation of the Village of Omemee, hereinafter called the "Corporation," party of the second part.

Whereas by the *Power Commission Act*, passed by the Legislature of the Province of Ontario, Revised Statutes of Ontario, 1914, chapter 39, and

amendments thereto, it was, amongst other things enacted, that any Municipal Corporation might apply to the Hydro-Electric Power Commission of Ontario for the transmission to such Corporation of electric power and energy for the use of the Corporation and the inhabitants thereof, for lighting, heating and power purposes;

And whereas the Corporation has applied to the Commission for a supply of electrical power or energy;

And whereas the Commission is in possession of, and operating in trust for the Ontario Government, the power developments known as the Central Ontario System and can supply therefrom electrical energy sufficient for the needs of the Corporation;

And whereas the electors of the Corporation assented to by-laws authorizing the Corporation to enter into a contract with the Commission for such power.

Now, therefore, this indenture witnesseth:

That in consideration of the premises and of the agreements of the parties hereto each agree with the other as follows: :

1. The Commission agrees:

(a) To reserve for and deliver to the Corporation fifty (50) or more horse-power of electrical power or energy at the point of delivery hereinafter specified.

(b) To reserve and deliver to the Corporation additional electrical power at the expiration of reasonable notice in writing, which may be given by the Corporation from time to time during the continuance of this agreement.

(c) To use at all times first-class, modern, standard, commercial apparatus and plant, and to exercise all due skill and diligence so that the service rendered to the Corporation hereunder shall be satisfactory.

(d) To deliver commercially continuous twenty-four (24) hour power every day in the year, except as provided for herein, at the point of delivery, viz., at the town limits on Sturgeon Street.

2. The Corporation agrees:

(a) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power covered by this agreement, so as to be able to receive power on the date of delivery.

(b) To take electric power exclusively from the Commission during the continuance of this agreement.

(c) To pay to the Commission for all power taken or held in reserve in monthly payments in gold coin at Toronto under the following schedule of rates:

For fifty (50) h.p. and up to seventy-five (75) h.p. at the rate of thirty-nine dollars and thirty-nine cents (\$39.39) per h.p. per annum.



When the amount of power taken and held in reserve for the Corporation has increased to seventy-five (75) h.p. or over the rate for all power taken shall be thirty-five dollars (\$35) per h.p. per annum.

Each month's payments are to be made as though the maximum amount taken during that month was taken for the whole month, save that paragraph (e) hereof shall govern the minimum.

(d) If the Corporation during any month takes more than the amount of power ordered and held in reserve for it for twenty (20) consecutive minutes, the taking of such excess power shall thereafter constitute an obligation on the part of the Corporation to pay for, and on the part of the Commission, as long as this greater amount does not exceed the maximum hereunder, to hold in reserve such increased quantity of power in accordance with the terms and conditions of this agreement.

(e) To pay each month to the Commission as a minimum for seventy-five per cent. (75%) of the power held in reserve for the Corporation at the rates fixed herein except as provided for in clause 5 (b) hereof.

(f) At all times to take and use the three-phase power in such a manner that the current will be equally taken from the three phases and in no case shall the difference between any two phases be greater than ten per cent. (10%).

(g) At all times to so take and use the three-phase power that the ratio of the kilowatts to the kilovolt-amperes is a maximum, but in any event the customer shall pay for at least ninety per cent. (90%) of the maximum kilovolt-amperes considered as true power or kilowatts. The maximum demand in kilowatt-amperes or kilowatts shall be taken as the maximum average or integrated demand over any twenty consecutive minutes.

One horse-power is defined as 0.746 kilowatts.

One kilowatt is defined as the produce of the instantaneous current, voltage and power-factor of the load as shown by a standard polyphase wattmeter and divided by 1,000.

One kilovolt -ampere is defined as the produce of the simultaneous average current per phase times the average voltage between phases, times 1.732 and divided by 1,000.

For the purposes of this agreement the kilovolt-amperes may be determined either directly by current and voltage measurements or by the kilowatts divided by the power-factor or by any other commercially accurate means as may be approved by the Commission.

The power-factor is defined as kilowatts divided by kilovolt-amperes.

(h) Bills shall be rendered by the Commission to the Corporation on or before the tenth day, and paid by the Corporation on or before the twentieth day of each calendar month.

If any bill remains unpaid for fifteen (15) days after the date thereof the Commission may, in addition to all other remedies, and without notice,

discontinue the supply of power to the Corporation until the said bill is paid, and no such discontinuance by the Commission shall relieve the Corporation from the performance of the covenants, provisoes and conditions herein contained.

All payments in arrears shall bear interest at the legal rate.

(i) To use at all times modern, standard, commercial apparatus and plant to be approved by the Commission from time to time, and to so operate and conduct the plant and apparatus as to cause minimum disturbances or fluctuations to the Commission's supply, and to exercise all due skill and diligence so as to secure the satisfactory operation of the plant and apparatus of both the Commission and the Corporation.

(j) Should it be expedient or necessary for the Commission, in order to deliver power hereunder, to construct or build poles, lines, cables, transformers, switches or other appliances or devices on, over or through the property of the Corporation, the Corporation hereby agrees to supply and arrange for such necessary rights-of-way free of cost, and satisfactory to the Commission for the life of this agreement, or renewals thereof, and for thirty (30) days thereafter, so that the Commission may build, erect, construct, operate, repair, maintain and remove any of said apparatus or devices belonging to the Commission.

3. The power delivered hereunder shall be alternating, three-phase, having a periodicity of approximately 60 cycles per second and a pressure of approximately 4,000 volts between phase wires, subject to normal variations in both frequency and voltage.

4.—(a) Measurement of the power held in reserve or taken by the Corporation hereunder shall be made by means of a standard polyphase graphic recording wattmeter, and other meters as required, so arranged as to accurately measure and record the power taken by the Corporation.

The greatest average or integrated power demand made by the Corporation for twenty (20) consecutive minutes in any month, as shown by the aforementioned instruments, shall be used as basis of billing and paying for the power taken by the Corporation hereunder.

(b) The point of measuring the power covered by this agreement shall be at the substation, approximately one mile north of the village, on Sturgeon Street, and the instruments, with necessary current and potential transformers for the measurements of power hereunder shall be provided, installed and maintained correct by the Commission.

(c) Whenever the said measuring instruments are connected at other than the point of delivery their reading shall be subject to a correction and shall be corrected to give a reading such as would be obtained by instruments connected at the point of delivery. Such corrections shall be based upon tests or calculations by the Commission.

(d) Should the point of measurement be located on the premises of the Corporation no rental charge shall be made to the Commission for the location of said instruments or transformers on the Corporation's premises.

(e) Access to said instruments and transformers belonging to the Commission shall be free to the Commission at any and all times and the Commission may test, calibrate or remove said measuring instruments and transformers at any reasonable time, but when possible the Corporation shall be advised at least seven days in advance of the Commission's intention to recalibrate, remove or change the measuring instrumentss.

(f) The Corporation shall have the right to test any such measuring instruments in the presence of a representative of the Commission, by giving to the Commission seven days' previous notice in writing of its desire to test such measuring instruments.

(g) The Commission shall repair or replace and retest defective meters or measuring equipment within a reasonable time, but, during the time there is no meter in service it shall be assumed that the power consumed is the same as for other days of the same month on which a similar load existed.

(h) The Corporation shall be responsible for any damage to the property or apparatus furnished by the Commission for the purpose of supplying or measuring power hereunder and installed on the Corporation's property, providing such damage originates from a source external to the said apparatus of the Commission, and is not due to defects in the apparatus of the Cimmission.

5.—(a) The maintenance by the Commission of approximately the agreed voltage at approximately the agreed frequency at the point of delivery shall constitute the supply of power involved herein and a fulfilment of all the operating obligations hereunder, and when the voltage and the frequency are so maintained the amount of power, its fluctuations, load factor, power factor, distribution as to phases, and all other characteristics and qualities are under the sole control of the Corporation, his agents, apparatus, appliances and circuits.

(b) In case the Commission shall at any time or times be prevented from delivering said power or any part thereof by strikes, lockouts, riot, fire invasion, explosion, act of God, the King's enemies, or any other cause or causes reasonably beyond its control, then the Commission shall not be bound to deliver such power during such time and the Corporation shall not be bound to pay for such power during such time.

(c) The Commission shall be prompt and diligent in removing the cause of such interruption, but the Corporation shall not be bound to pay for such power during such time. As soon as the cause of such interruption is removed the Commission shall, without any delay, deliver the said power as aforesaid, and the Corporation shall take and use the same.

(d) It is further agreed hereby that the Commission shall have the right, at reasonable times and when possible, after due notice has been given to the Corporation, to discontinue the supply of power to the Corporation for the purposes of safeguarding life or property, or for the purpose of making repairs, renewals, or replacements to the lines or apparatus of the Commission, but all such interruptions shall be of a minimum duration and when possible arranged for at a time least objectionable to the Corporation.

Such interruptions shall not release the Corporation from his obligations to pay for or resume the use of power when service is restored.

6. A representative or engineer of the Commission appointed for this purpose may, at any reasonable time during the continuance of this agreement, have access to the premises of the Corporation for the purpose of inspecting the electrical apparatus, plant or property of the Corporation and to take records therefrom as required.

7. It is mutually agreed:

That this agreement shall be binding upon both parties hereto for a period of twenty (20) years, beginning on the day and date when power is first taken hereunder, and this agreement may be extended for a further term of five (5) years upon the mutual agreement of both parties hereto before three (3) months of the expiration of this agreement or any extension or renewal period.

8. The Commission shall be entitled at the termination of this agreement or any extension thereof, or within thirty (30) days thereafter, to remove from the Corporation's premises any and all plant or equipment which may have been installed by the Commission for the supply or measurement of power hereunder.

In witness whereof the said Commission and the said Corporation have duly affixed their respective seals and signatures of their respective officers this 4th day of April A.D., nineteen hundred and seventeen (1917).

Signed, sealed and delivered  
in the presence of:

HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

(SEAL.)

A. BECK, *Chairman.*

W. W. POPE, *Secretary.*

THE MUNICIPAL CORPORATION OF THE VILLAGE OF OMEMEE.

(SEAL.)

T. J. PARSONS, *Reeve.*

W. H. KENNEDY, *Clerk.*

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## SCHEDULE "P."

This agreement made this 10th day of March, A.D. 1917,

Between

The Hydro-Electric Power Commission of Ontario, herein called the "Commission," party of the first part;

and

The Municipal Corporation of the Township of Brock, herein called the "Corporation," party of the second part.

Whereas pursuant to an Act to provide for the transmission of electrical power to municipalities, the Corporation applied to the Commission for a supply of power;

And whereas the Corporation under the provision of the *Power Commission Act* and amendments thereto and the *Power Commission Act Revised Statutes of Ontario, 1914*, chapter 39, part 2, being "An Act to provide for the supply of electrical energy or power to individual users," has, at the request of a number of ratepayers (petitioners) applied to the Commission for a supply of electrical power or energy, and has passed a By-law No. 654 to authorize the execution of an agreement therefor;

And whereas the Commission has entered into contracts with power companies for such power, or has acquired or constructed generating plants, transformer stations, transmission lines, distributing stations and other work necessary for the delivery of electrical energy or power to municipalities;

Now, therefor, this indenture witnesseth that in consideration of the premises and of the agreements herein set forth, subject to the provisions of the said Act and amendments thereto, the parties hereto agree each with the other as follows:—

1. The Commission agrees:

(a) To reserve and deliver at the earliest possible date electrical power to the Corporation as required by the Corporation.

(b) At the expiration of thirty (30) days' notice in writing, which may be given by the Corporation from time to time during the continuance of this agreement, to reserve and deliver to the Corporation additional electrical power as may be required from time to time.

(c) To use at all times first-class, modern, standard, commercial apparatus and plant, and to exercise due skill and diligence so as to secure the most perfect operation of the plant and apparatus of the Corporation.

(d) Power shall be delivered to the Corporation at approximately 2,200 or 4,000 volts, or at any other primary voltage that may be available for the Corporation's use.

(e) To supply and construct all 2,200, 4,000 or other lines at primary voltage made necessary by contracts for electric service made between the Corporation and residents or users, within the township, from the Commission's transformer station or stations to the service transformers of the Corporation, located at such points as the Commission may approve.

2. The Corporation agrees:

(a) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power dealt with by this agreement, so as to be able to give notice as specified in paragraph 1 (b).

(b) Subject to the provisions of paragraph 2 (g) herein, to pay to the Commission monthly, for all power taken, the cost of the power delivered to the Commission, plus the charges in connection with the delivery of the power to the Municipality as outlined in clauses 2 (c) and (d).

(c) To pay, annually, in twelve monthly instalments, interest upon its proportionate part of the moneys expended by the Commission on capital account for the acquiring of properties and rights, and acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations and other necessary works for the delivery of power to the Corporation; to pay an annual sum for its proportionate part of all moneys expended by the Commission on capital account for the acquiring of the said properties and rights, and the cost of said construction, so as to form in thirty years a sinking fund for the retirement of securities issued by the Province of Ontario; and to bear its proportionate part of the line loss, and pay its proportionate part of the cost to operate, maintain, repair, renew and insure the said lines, generator and transformer stations and works. All payments under this paragraph shall be subject to adjustment under paragraph 7.

(d) In addition to the cost of power and the cost of delivering it to the Corporation as provided for in paragraphs 2 (b) and (c), to pay to the Commission in half-yearly instalments interest and sinking fund on a thirty-year basis on all capital invested by the Commission in 2,200, 4,000 or other lines of primary voltage as provided for in paragraph 1 (e), and to maintain, repair, renew and operate the said lines, and set aside a depreciation fund at the rate of five per cent. per annum on all capital expended by the Commission on such construction.

(e) The amounts payable in accordance with clauses 2 (a), (c) and (d) shall be paid in gold coin of the present standard of weight and fineness, at the office of the Commission at Toronto, and bills shall be rendered by the Commission on or before the 15th day and paid by the Corporation on or before the 15th day of each month, except that payments under clause 2 (d) shall be made half-yearly. If any bill remains unpaid for fifteen days, the Commission may, in addition to all other remedies and without notice, discontinue the supply of power to the Corporation until said bill is paid. No such discontinuance shall relieve the Corporation from the performance of the covenants, provisions and conditions herein contained. All payments in arrears shall bear interest at the legal rate.

(f) To take power exclusively from the Commission during the continuance of this agreement.

(g) To pay for three-fourths of the power ordered from time to time by the Corporation and held in reserve for it as herein provided whether it takes the same or not. When the highest average amount of power taken for any twenty consecutive minutes during any month shall exceed during the twenty consecutive minutes three-fourths of the amount ordered by the Corporation and held in reserve, then the Corporation shall pay for this greater amount during the entire month.

If the Corporation during any month takes more than the amount of power ordered and held in reserve for it, as determined by an integrated peak, or highest average, for a period of twenty consecutive minutes, the Corporation shall pay for this greater amount of power during the entire month. The taking of such excess shall thereafter constitute an obligation on the part of the Corporation to pay for and on the part of the Commission to hold in reserve an additional block of power in accordance with the terms and conditions of this contract.

When the power factor of the greatest amount of power taken for the said twenty consecutive minutes falls below 90 per cent., the Corporation shall pay for 90 per cent. of said power divided by the power factor.

(h) To use at all times first-class, modern, standard, commercial apparatus and plant to be approved by the Commission and to exercise all due skill and diligence so as to secure the most perfect operation of the plant and apparatus of the Commission and of the Corporation.

(i) To co-operate, by all means in its power, at all times, with the Commission, to increase the quantity of power required from the Commission, and in all other respects to carry out the objects of this agreement and of the said Act.

3. This agreement shall remain in force for thirty (30) years from the date of the first delivery of power under this contract.

4. The power shall be three-phase, alternating, commercially continuous twenty-four hour power every day in the year except as provided in paragraph 6, having a periodicity of approximately 60 cycles per second, and shall be delivered as aforesaid at a voltage suitable for distribution within the Municipality.

(a) That the meters with their series and potential transformers shall be connected at the point of delivery, and shall be subject to test as to accuracy by either party hereto.

(b) The maintenance by the Commission of approximately the agreed voltage at approximately the agreed frequency at the point of delivery to the Corporation shall constitute the supply of all power involved herein and the fulfilment of all operating obligations hereunder; and when voltage and frequency are so maintained, the amount of the power, its fluctuations, load factor, power factor, distribution as to phases, and all other electric characteristics and qualities are under the sole control of the Corporation, their agents, customers, apparatus, appliances and circuits.

5. The engineers of the Commission, or one or more of them, or any other person or persons appointed for this purpose by the Commission, shall have

the right from time to time during the continuance of this agreement, to inspect the apparatus, plant and property of the Corporation and take records at all reasonable hours.

6. In case the Commission should at any time or times be prevented from supplying said power, or any part thereof, or in case the Corporation shall at any time be prevented from taking said power, or any part thereof, by strike, lock-out, fire, invasion, explosion, act of God, or the King's enemies, or any other cause reasonably beyond their control, then the Commission shall not be bound to deliver such power during such times, and the Corporation shall not be bound to pay the price of said power during such times.

7. The Commission shall at least annually adjust and apportion the amounts payable by Municipal Corporations for such power and such interest, sinking fund, line loss, and cost of operating, maintaining, repairing, renewing and insuring the line and works.

8. It is hereby declared that the Commission is to be a trustee of all property held by the Commission under this agreement for the Corporation and other Municipal Corporations supplied by the Commission, but the Commission shall be entitled to a lien upon said property for all moneys expended by the Commission under this agreement and not repaid. At the expiration of this agreement the Commission shall determine and adjust the rights of the Corporation and other Municipal Corporations, supplied by the Commission, having regard to the amounts paid by them respectively under the terms of this agreement, and such other considerations as may appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

9. If at any time any other Municipal Corporation or pursuant to said Act any railway or distributing company, or any other Corporation or person, applies to the Commission for a supply of power, the Commission shall notify the applicant and the Corporation in writing of a time and place, and hear all representations that may be made as to the terms and conditions for such supply.

Without discrimination in favour of applicants as to the price to be paid, for equal quantities of power, the Commission may supply power upon such terms and conditions as may, having regard to the risk and expense incurred, and paid, and to be paid by the Corporation, appear equitable to the Commission, and are approved by the Lieutenant-Governor in Council.

10. In case any Municipal Corporation or any person, firm or Corporation, which shall contract with the Commission or any Municipal Corporation, for a supply of power furnished to the Commission by a power company, shall suffer damages by the act or neglect of the company, and such Municipal Corporation, person, firm or Corporation would, if the Company had made the said contracts directly with them, have had a right to recover such damages or commence any proceedings or any other remedy, the Commission shall be entitled to commence any such proceedings to bring such action for or on behalf of such Municipal Corporation, person, firm or Corporation, and notwithstanding any Act, decision or rule of law to the contrary, the Commission shall be entitled to all the rights and remedies of such Municipal Corporation, person, firm or Corporation, including the right to recover such damages, but no action shall be brought by the Commission until such



Municipal Corporation, person, firm or Corporation shall have agreed with the Commission to pay any costs that may be adjudged to be paid if such proceedings or action is unsuccessful. The rights and remedies of any such Municipal Corporation, person, firm or Corporation shall not be hereby prejudiced.

11. If differences arise between Corporations to whom the Commission is supplying power, the Commission may, upon application, fix a time and place to hear all representations that may be made by the parties, and the Commission shall, in a summary manner when possible, adjust such differences, and such adjustment shall be final.

The Commission shall have all the powers that may be conferred upon a Commissioner appointed under the *Act Respecting Enquiries Concerning Public Matters*.

12. This agreement shall extend to, be binding upon and enure to the benefit of the successors and assigns of the parties hereto.

In witness whereof the Commission and the Corporation have respectively affixed their corporate seals and the hands of their proper officers.

HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

A. BECK, *Chairman*.

(SEAL.)

W. W. POPE, *Secretary*.

MUNICIPAL CORPORATION OF THE TOWNSHIP OF BROCK.

DEAN RUNDLE, *Reeve*.

(SEAL.)

FRANK DOBLE, *Clerk*.

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SCHEDULE "Q."

This agreement made this 2nd day of June, A.D. 1917.

Between

The Hydro-Electric Power Commission of Ontario, herein called the "Commission," party of the first part;

and

The Municipal Corporation of the Township of Derby, in the County of Grey, herein called the "Corporation," party of the second part.

Whereas, pursuant to an Act to provide for the transmission of electrical power to municipalities, the Corporation applied to the Commission for a supply of power.

And whereas the Corporation, under the provisions of *The Power Commission Act* and amendments thereto and *The Power Commission Act of*

1911, being "An Act to provide for the local Distribution of Electrical Power," has, at the request of a number or ratepayers (petitioners), applied to the Commission for a supply of electrical power or energy, and has passed a By-law, No. 9 of 1917, to authorize the execution of an agreement therefor.

1. Now, therefore, this indenture witnesseth that in consideration of the premises and of the agreements of the Corporation set forth, subject to the provisions of said Act and amendments and of the said contract, the Commission agrees with the Corporation:

(a) To reserve and deliver at the earliest possible date electrical power to the Corporation, as required by the Corporation.

(b) At the expiration of thirty (30) days' notice in writing, which may be given by the Corporation from time to time during the continuance of this agreement, to reserve and deliver to the Corporation additional electric power as may be required from time to time.

(c) To use at all times first-class, modern, standard, commercial apparatus and plant, and to exercise due skill and diligence, so as to secure the most perfect operation of the plant and apparatus of the Corporation.

(d) Power shall be delivered to the Corporation at approximately 2,200 or 4,000 volts, or at any other primary voltage that may be available for the Corporation's use.

(e) To supply and construct all 2,200 volt, 4,000 volt, or other lines at primary voltage made necessary by contracts for electric service made between the Corporation and residents or users within the township, from the Commission's power station or transformer stations to the service transformers of the Corporation located at such points as the Commission may approve, except in that part of the township known as Kilsyth, and it is hereby understood and agreed upon by both parties hereto that all of the cost of the primary, secondary and street lighting distribution systems located within the hamlet of Kilsyth and upon the streets of same shall be paid for direct by the Corporation, including all meters, transformers, services, street lighting brackets, poles, wires, cross arms, and any equipment necessary to serve the consumers within the said hamlet of Kilsyth.

2. In consideration of the premises and of the covenants and agreements herein set forth, the Corporation agrees with the Commission:

(a) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power dealt with by this agreement, so as to be able to give notice, as specified in paragraph 1 (b).

(b) Subject to the provisions of clause (g), section 2, herein, to pay the Commission monthly for all power taken, the cost of the power to be delivered by the Commission, plus the charges in connection with the delivery of power to the Municipality, as outlined in clauses 2 (c) and (d).

(c) To pay annually interest at the rate payable by the Commission upon the Corporation's proportionate part (based on the quantity of electrical energy of power taken) of all moneys expended by the Commission on capital account for the acquiring of properties and rights, and acquiring and con-

struction of generating plants, transformer stations, transmission lines, distributing stations and other works necessary for the delivery of said electrical energy or power to the Corporation under the terms of this contract. Also to pay an annual sinking fund instalment of such amount as to form at the end of thirty (30) years, with accrued interest, a sinking fund sufficient to repay the Corporation's proportionate part, based as aforesaid, of all moneys advanced by the Province of Ontario for the acquiring of properties and rights, the acquiring and construction of generating plant, transformer stations, transmission lines, distribution stations and other works necessary for delivery of said electrical energy or power delivered to the Corporation under the terms of this contract. Also to pay the Corporation's proportionate part, based as aforesaid, of the cost of lost power and of the cost of operating, maintaining, repairing, renewing and insuring said generating plants, transformer stations, transmission lines, distributing stations and other necessary works. Subject to adjustment under clause 8 of this agreement.

(d) In addition to the cost of power and cost of delivering it to the Corporation, as provided for in paragraph 2 (b) and (c), to pay to the Commission, in half-yearly instalments, interest and sinking fund on a thirty (30) year basis on all capital invested by the Commission in 2,200 volt, 4,000 volt, or other lines of primary voltage, as provided for in paragraph 1 (c), and to maintain, repair, renew and operate the said lines and set aside a depreciation fund at the rate of 5 per cent. per annum on all capital expended by the Commission on such construction.

The payments covering cost of construction of primary lines, as outlined in this clause 2 (d) shall not apply to the portion of the township known as Kilsyth, and the capital cost of all primary, secondary and street lighting distribution lines in this locality, including all meters, transformers, and other necessary equipment for the distribution system, shall be borne entirely by the Corporation, but shall be constructed by the Commission, and the Corporation shall make payment to the Commission within thirty (30) days after rendering of account covering moneys spent by the Commission on construction of said primary, secondary and street lighting distribution lines, including all meters, transformers and other necessary equipment as mentioned above, comprising the said distribution system in the hamlet of Kilsyth.

(e) The amounts payable in accordance with clauses 2 (b) (c) and (d) shall be paid in gold coin of the present standard of weight and fineness, at the office of the Commission at Toronto, and bills shall be rendered by the Commission on or before the 5th day and paid by the Corporation on or before the 15th day of each month, except that payments under clause 2 (d) shall be made half-yearly. If any bill remains unpaid for 15 days the Commission may, in addition to all other remedies, and without notice, discontinue the supply of power to the Corporation until said bill is paid. No such discontinuance shall relieve the Corporation from the performance of the covenants, provisoes and conditions herein contained, and payments in arrears shall bear interest at the legal rate.

(f) To take power exclusively from the Commission during the continuance of this agreement.

(g) To pay for three-fourths of the power ordered from time to time by the Corporation and held in reserve for it as herein provided, whether it

takes the same or not. When the highest average amount of power taken for any twenty consecutive minutes during any month shall exceed during twenty consecutive minutes three-fourths of the amount of power ordered by the Corporation and held in reserve, then the Corporation shall pay for this greater amount during the entire month. If the Corporation during any month takes more than the amount of power ordered and held in reserve for it, as determined by an integrated peak, or the highest average for a period of twenty (20) consecutive minutes, the Corporation shall pay for this greater amount of power during the entire month. The taking of such excess shall therefore constitute an obligation on the part of the Corporation to pay for and on the part of the Commission to hold in reserve an additional block of power in accordance with the terms and conditions of this agreement.

When the power factor at any time falls below ninety per cent. (90%) the Corporation shall pay for ninety per cent (90%) of the kilovolt amperes, providing that said ninety per cent. (90%) of said kilovolt amperes is greater than the maximum kilowatts for any twenty (20) minute period during the month.

(h) To use at all times first-class, modern, standard, commercial apparatus and plant to be approved by the Commission, and to exercise all due skill and diligence so as to secure the most perfect operation of the plant and apparatus of the Commission and of the Corporation.

(i) To co-operate by all means in its power, at all times, with the Commission, to increase the quantity of power required from the Commission and in all other respects to carry out the objects of this agreement and of the said Act.

3. This agreement shall remain in force for thirty (30) years from the date of the first delivery of power hereunder.

4. The power shall be three-phase, alternating, commercially continuous twenty-four hour power every day of the year, except as provided in paragraph 6, having a periodicity of approximately 60 cycles per second, and shall be delivered as aforesaid at a voltage suitable for distribution within the municipality.

(a) That the meters with their series and potential transformers shall be connected at the point of delivery, and shall be subject to test as to accuracy by either party hereto.

(b) The maintenance by the Commission of approximately the agreed voltage at approximately the agreed frequency at the point of delivery to the Corporation shall constitute the supply of all power involved herein and the fulfilment of all operating obligations hereunder; and when voltage and frequency are so maintained, the amount of power, its fluctuations, load factor, power factor, distribution as to phases, and all other electric characteristics and qualities are under the sole control of the Corporation, their agents, customers, apparatus, appliances and circuits.

5. The engineers of the Commission, or one or more of them, or any other person or persons appointed for this purpose by the Commission, shall have the right from time to time during the continuance of this agreement, to



inspect the apparatus, plant and property of the Corporation and take records at all reasonable hours.

6. In case the Commission should at any time or times be prevented from supplying said power, or any part thereof, or in case the Corporation shall at any time be prevented from taking said power, or any part thereof, by strike, lock-out, fire, invasion, explosion, act of God, or the King's enemies, or any other cause reasonably beyond their control, then the Commission shall not be bound to deliver such power during such times, and the Corporation shall not be bound to pay the price of such power, during such times.

7. The Commission shall at least annually adjust and apportion the amounts payable by Municipal Corporations for such power and such interest, sinking fund, line loss, and cost of operating, maintaining, repairing, renewing and insuring the lines and works.

8. It is hereby declared that the Commission is to be a trustee of all property held by the Commission under this agreement for the Corporation and other Municipal Corporations supplied by the Commission, but the Commission shall be entitled to a lien upon said property for all moneys expended by the Commission under this agreement and not repaid. At the expiration of this agreement the Commission shall determine and adjust the rights of the Corporation and other Municipal Corporations supplied by the Commission, having regard to the amounts paid by them, respectively, under the terms of this agreement, and such other considerations as may appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

9. If at any time any other Municipal Corporation or, pursuant to said Act, any railway or distributing company, or any other corporation or person, applies to the Commission for a supply of power, the Commission shall notify the applicant and the Corporation, in writing, of a time and place and hear all representations that may be made as to the terms and conditions for such supply.

Without discrimination in favour of the applicants as to the price to be paid, for equal quantities of power, the Commission may supply power upon such terms and conditions as may, having regard to the risk and expense incurred, and paid, and to be paid by the Corporation, appear equitable to the Commission, and are approved by the Lieutenant-Governor in Council.

10. If differences arise between Corporations to whom the Commission is supplying power, the Commission may, upon application, fix a time and place to hear all representations that may be made by the parties, and the Commission shall, in a summary manner, when possible, adjust such differences, and such adjustment shall be final.

The Commission shall have all the powers that may be conferred upon a Commissioner appointed under the *Act Respecting Enquiries Concerning Public Matters*.

11. This agreement shall extend to, be binding upon and enure to the benefit of the successors and assigns of the parties hereto.

In witness whereof the Commission and the Corporation have, respectively, affixed their corporate seals and the hands of their proper officers.

HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

(SEAL.)

A. BECK, *Chairman,*

W. W. POPE, *Secretary.*

MUNICIPAL CORPORATION OF THE TOWNSHIP OF DERBY, IN THE  
COUNTY OF GREY.

(SEAL.)

JOHN LEASH, *Reeve.*

W. H. HILTS, *Clerk.*

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SCHEDULE "R."

This Agreement made this 20th day of May, A.D. 1917,

Between

The Hydro-Electric Power Commission of Ontario, herein called the  
"Commission," party of the first part;

and

The Municipal Corporation of the Township of Thorah, herein called the  
"Corporation," party of the second part.

Whereas, pursuant to an Act to provide for the transmission of electrical power to municipalities, the Corporation applied to the Commission for a supply of power.

And whereas the Corporation under the provisions of *The Power Commission Act* and amendments thereto, and *The Power Commission Act*, Revised Statutes of Ontario, 1914, Chapter 39, Paragraph (2), being an "Act to Provide for the Supply of Electrical Energy and Power to Individual Users, has, at the request of a number of ratepayers (petitioners) applied to the Commission for a supply of electrical power or energy, and has passed a By-law No. 247 to authorize the execution of an agreement therefor.

And whereas the Commission has entered into contracts with power companies for such power, or has acquired or constructed generating plants, transformer stations, transmission lines, distributing stations and other works necessary for the delivery of electrical energy or power to municipalities.

Now, therefore, this indenture witnesseth that in consideration of the premises and of the agreement herein set forth, subject to the provisions of the said Act and amendments thereto, the parties hereto agree each with the other as follows: ■

1. The Commission agrees:—

(a) To reserve and deliver at the earliest possible date electrical power to the Corporation as required by the Corporation.

(b) At the expiration of thirty (30) days' notice in writing, which may be given by the Corporation from time to time during the continuance of this agreement, to reserve and deliver to the Corporation additional electric power as may be required from time to time.

(c) To use at all times first-class, modern, standard, commercial apparatus and plant, and to exercise due skill and diligence, so as to secure the most perfect operation of the plant and apparatus of the Corporation.

(d) Power shall be delivered to the Corporation at approximately 2,200 or 4,000 volts, or at any other primary voltage that may be available for the Corporation's use.

(e) To supply and construct all 2,200 volt, 4,000 volt, or other lines at primary voltage made necessary by contracts for electric service made between the Corporation and residents or users within the township, from the Commission's transformer station or stations to the service transformers of the Corporation, located at such points as the Commission may approve.

2. The Corporation agrees:—

(a) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power dealt with by this agreement, so as to be able to give notice as specified in Paragraph 1 (b).

(b) Subject to the provisions of Paragraph 2 (g) herein, to pay to the Commission monthly, for all power taken, the cost of the power delivered to the Commission, plus the charges in connection with the delivery of the power to the municipality as outlined in clauses 2 (c) and (d).

(c) To pay, annually, in twelve monthly instalments, interest upon its proportionate part of the moneys expended by the Commission on capital account for the acquiring of properties and rights, and acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations and other necessary works for the delivery of power to the Corporation; to pay an annual sum for its proportionate part of all moneys expended by the Commission on capital account for the acquiring of the said properties and rights, and the cost of the said construction so as to form in thirty years a sinking fund for the retirement of securities issued by the Province of Ontario; and to bear its proportionate part of the line loss, and pay its proportionate part of the cost to operate, maintain, repair, renew and insure the said lines, generator and transformer stations and works. All payments under this paragraph shall be subject to adjustment under paragraph 7.

(d) In addition to the cost of power, and the cost of delivering it to the Corporation as provided for in paragraph 2 (b) and (c), to pay to the Commission in half-yearly instalments, interest and sinking fund on a thirty-year basis on all capital invested by the Commission in 2,200, 4,000 or other lines of primary voltage as provided for in paragraph 1 (e), and to main-

tain, repair, renew and operate the said lines, and set aside a depreciation fund at the rate of 5 per cent. per annum on all capital expended by the Commission on such construction.

(e) The amounts payable in accordance with clause 2 (b), (c) and (d) shall be paid in gold coin of the present standard of weight and fineness, at the office of the Commission at Toronto, and bills shall be rendered by the Commission on or before the 5th day and paid by the Corporation on or before the 15th day of each month, except that payments under clause 2 (d) shall be made half yearly. If any bill remains unpaid for fifteen days, the Commission may, in addition to all other remedies and without notice, discontinue the supply of power to the Corporation until said bill is paid: No such discontinuance shall relieve the Corporation from the performance of the covenants, provisos and conditions herein contained. All payments in arrears shall bear interest at the legal rate.

(f) To take power exclusively from the Commission during the continuance of this agreement.

(g) To pay for three-fourths of the power ordered from time to time by the Corporation and held in reserve for it as herein provided whether it takes the same or not. When the highest average amount of power taken for any twenty consecutive minutes during any month shall exceed during the twenty consecutive minutes three-fourths of the amount ordered by the Corporation and held in reserve, then the Corporation shall pay for this greater amount during the entire month.

If the Corporation during any month takes more than the amount of power ordered and held in reserve for it, as determined by an integrated peak, or highest average, for a period of twenty consecutive minutes, the Corporation shall pay for this greater amount of power during the entire month. The taking of such excess shall thereafter constitute an obligation on the part of the Corporation to pay for and on the part of the Commission to hold in reserve an additional block of power in accordance with the terms and conditions of this contract.

When the power factor of the greatest amount of power taken for said twenty minutes falls below 90 per cent., the Corporation shall pay for 90 per cent. of the said power divided by the power factor.

(h) To use at all time first-class, modern, standard, commercial apparatus and plant to be approved by the Commission and to exercise all due skill and diligence so as to secure the most perfect operation of the plant and apparatus of the Commission and of the Corporation.

(i) To co-operate, by all means in its power, at all times, with the Commission, to increase the quantity of power required from the Commission and in all other respects to carry out the objects of this agreement and of the said Act.

3. This agreement shall remain in force for thirty (30) years from the date of the first delivery of power under this contract.

4. The power shall be three-phase, alternating, commercially, continuous twenty-four hour power every day in the year except as provided in para-



graph 6, having a periodicity of approximately 60 cycles per second, and shall be delivered as aforesaid at a voltage suitable for distribution within the municipality.

(a) That the meters with their series and potential transformers shall be connected at the point of delivery, and shall be subject to test as to accuracy by either party hereto.

(b) The maintenance by the Commission of approximately the agreed voltage at approximately the agreed frequency at the point of delivery to the Corporation shall constitute the supply of all power involved herein and the fulfilment of all operating obligations hereunder; and when voltage and frequency are so maintained, the amount of the power, its fluctuations, load factor, power factor, distribution as to phases, and all other electric characteristics and qualities are under the sole control of the Corporation, their agents, customers, apparatus, appliances and circuits.

5. The engineers of the Commission, or one or more of them, or any person or persons appointed for this purpose by the Commission, shall have the right from time to time during the continuance of this agreement, to inspect the apparatus, plant and property of the Corporation and take records at all reasonable hours.

6. In case the Commission should at any time or times be prevented from supplying said power, or any part thereof, or in case the Corporation shall at any time be prevented from taking said power, or any part thereof, by strike, lock-out, fire, invasion, explosion, act of God, or the King's enemies, or any other cause reasonably beyond their control, then the Commission shall not be bound to deliver such power during such times, and the Corporation shall not be bound to pay the price of said power, during such times.

7. The Commission shall at least annually adjust and apportion the amounts payable by Municipal Corporations for such power and such interest, sinking fund, line loss, and cost of operating, maintaining, repairing, renewing and insuring the line and works.

8. It is hereby declared that the Commission is to be a trustee of all property held by the Commission under this agreement for the Corporation and other Municipal Corporations supplied by the Commission, but the Commission shall be entitled to a lien upon said property for all moneys expended by the Commission under this agreement and not repaid. At the expiration of this agreement the Commission shall determine and adjust the rights of the Corporation and other Municipal Corporations, supplied by the Commission, having regard to the amounts paid them, respectively, under the terms of this agreement, and such other considerations as may appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

9. It at any time any other Municipal Corporation or pursuant to said Act, any railway or distributing company, or any other Corporation or person, applies to the Commission for a supply of power, the Commission shall notify the applicant and the Corporation in writing, of a time and place and hear all representations that may be made as to the terms and conditions for such supply.

Without discrimination in favour of the applicants as to the price to be paid for equal quantities of power the Commission may supply power upon

such terms and conditions as may, having regard to the risk and expense incurred, and paid, and to be paid by the Corporation, appear equitable to the Commission, and are approved by the Lieutenant-Governor in Council.

10. In case any Municipal Corporation or any person, firm or Corporation, which shall contract with the Commission or any Municipal Corporation, for a supply of power furnished to the Commission by a power company shall suffer damages by the act or neglect of the company, and such Municipal Corporation, person, firm or Corporation would, if the company had made the said contracts directly with them, have had a right to recover such damages or commence any proceedings or any other remedy, the Commission shall be entitled to commence any such proceedings to bring such action for or on behalf of such Municipal Corporation, person, firm, or Corporation, and notwithstanding any act, decision or rule of law to the contrary, the Commission shall be entitled to all the rights and remedies of such Municipal Corporation, person, firm or Corporation, including the right to recover such damages, but no action shall be brought by the Commission until such Municipal Corporation, person, firm or Corporation shall have agreed with the Commission to pay any costs that may be adjudged to be paid if such proceedings or action is unsuccessful. The rights and remedies of any such Municipal Corporation, person, firm or Corporation shall not be hereby prejudiced.

11. If differences arise between Corporations to whom the Commission is supplying power, the Commission may, upon application, fix a time and place to hear all representations that may be made by the parties and the Commission shall, in a summary manner when possible, adjust such differences and such adjustment shall be final.

The Commission shall have all the powers that may be conferred upon a Commissioner appointed under the *Act Respecting Enquiries Concerning Public Matters*.

12. This agreement shall extend to, be binding upon, and enure to the benefit of the successors and assigns of the parties hereto.

In witness whereof the Commission and the Corporation have respectively affixed their Corporate seals and the hands of their proper officers.

HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

A. BECK, *Chairman*.

(SEAL.)

W. W. POPE, *Secretary*.

MUNICIPAL CORPORATION OF THE TOWNSHIP OF THORAH.

GEO. WILL, *Reeve*.

(SEAL.)

JOHN MCARTHUR, *Clerk*.

## SCHEDULE "S."

This agreement made this 20th day of September, A.D. 1917.

Between

The Hydro-Electric Power Commission of Ontario, herein called the  
"Commission," party of the first part,

and

The Municipal Corporation of the Township of Whitby, herein called the  
"Corporation," party of the second part.

Whereas pursuant to an Act to provide for the transmission of electrical power to municipalities, the Corporation applied to the Commission for a supply of power;

And whereas the Corporation under the provisions of *The Power Commission Act* and amendments thereto and the *Power Commission Act*, Revised Statutes of Ontario, 1914, chapter 39, part 2, being "An Act to Provide for the Supply of Electrical Energy or Power to Individual Users," has, at the request of a number of ratepayers (petitioners) applied to the Commission for a supply of electrical power or energy, and has passed a by-law No. 997, to authorize the execution of an agreement therefor;

And whereas the Commission has entered into contracts with power companies for such power, or has acquired or constructed generating plants, transformer stations, transmission lines, distributing stations and other works necessary for the delivery of electrical energy or power to municipalities.

Now, therefore, this indenture witnesseth that in consideration of the premises and of the agreement herein set forth, subject to the provisions of the said Act and amendments thereto, the parties hereto agree each with the other as follows:

1. The Commission agrees:

(a) To reserve and deliver at the earliest possible date electrical power to the Corporation as required by the Corporation.

(b) At the expiration of thirty (30) days' notice in writing which may be given by the Corporation from time to time during the continuance of this agreement, to reserve and deliver to the Corporation additional electrical power as may be required from time to time.

(c) To use at all times first class, modern, standard, commercial apparatus and plant, and to exercise due skill and diligence so as to secure the most perfect operation of the plant and apparatus of the Corporation.

(d) Power shall be delivered to the Corporation at approximately 2,200 or 4,000 volts, or at any other primary voltage that may be available for the Corporation's use.

(e) To supply and construct all 2,200 and 4,000 or other lines at primary voltage made necessary by contracts for electric service made between the Corporation and residents or users, within the township, from the Commission's transformer station or stations to the service transformers of the Corporation, located at such points as the Commission may approve.

2. The Corporation agrees:

(a) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power dealt with by this agreement, so as to be able to give notice as specified in paragraph 1 (b).

(b) Subject to the provisions of paragraph 2 (g) herein, to pay to the Commission monthly, for all power taken, the cost of the power delivered to the Commission, plus the charges in connection with the delivery of the power to the municipality as outlined in clauses 2 (c) and (d).

(c) To pay, annually, in twelve monthly instalments, interest upon its proportionate part of the moneys expended by the Commission on capital account for the acquiring of the properties and rights, and acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations and other necessary works for the delivery of power to the Corporation; to pay an annual sum for its proportionate part of all moneys expended by the Commission on capital account for the acquiring of the said properties and rights, and the cost of the said construction, so as to form in thirty years a sinking fund for the retirement of the securities issued by the Province of Ontario; and to bear its proportionate part of the line loss, and pay its proportionate part of the cost to operate, maintain, repair, renew, and insure the said lines, generator and transformer stations and works. All payments under this paragraph shall be subject to adjustment under paragraph 7.

(d) In addition to the cost of power, and the cost of delivering it to the Corporation as provided for in paragraphs 2 (b) and (c), to pay to the Commission in half-yearly instalments, interest and sinking fund on a thirty-year basis on all capital invested by the Commission in 2,200, 4,000 or other lines of primary voltage as provided for in paragraph 1 (e), and to maintain, repair, renew and operate the said lines, and set aside a depreciation fund at the rate of five per cent. per annum on all capital expended by the Commission on such construction.

(e) The amounts payable in accordance with Clause 2 (b), (c) and (d) shall be paid in gold coin of the present standard of weight and fineness, at the office of the Commission at Toronto, and bills shall be rendered by the Commission on or before the 5th day and paid by the Corporation on or before the 15th day of each month, except that payments under clause 2 (d) shall be made half yearly. If any bill remains unpaid for fifteen days, the Commission may, in addition to all other remedies and without notice, discontinue the supply of power to the Corporation until said bill is paid. No such discontinuance shall relieve the Corporation from the performance of the covenants, provisoes and conditions herein contained. All payments in arrears shall bear interest at the legal rate.

(f) To take power exclusively from the Commission during the continuance of this agreement.



(g) To pay for three-fourths of the power ordered from time to time by the Corporation and held in reserve for it as herein provided whether it takes the same or not.

When the highest average amount of power taken for any twenty consecutive minutes during any month shall exceed during the twenty consecutive minutes three-fourths of the amount ordered by the Corporation and held in reserve, then the Corporation shall pay for this greater amount during the entire month.

If the Corporation during any month takes more than the amount of power ordered and held in reserve for it, as determined by an integrated peak, or highest average, for a period of twenty consecutive minutes, the Corporation shall pay for this greater amount of power during the entire month. The taking of such excess shall thereafter constitute an obligation on the part of the Corporation to pay for and on the part of the Commission to hold in reserve an additional block of power in accordance with the terms and conditions of this contract.

When the power factor of the greatest amount of power taken for said twenty consecutive minutes falls below 90%, the Corporation shall pay for 90% of said power divided by the power factor.

(h) To use at all times first class, modern, standard commercial apparatus and plant to be approved by the Commission and to exercise all due skill and diligence so as to secure the most perfect operation of the plant and apparatus of the Commission and of the company.

(i) To co-operate, by all means in its power, at all times, with the Commission, to increase the quantity of power required from the Commission and in all other respects to carry out the objects of this agreement and of the said Act.

3. This agreement shall remain in force for thirty (30) years from the date of the first delivery of power under this contract.

4. The power shall be three-phase, alternating, commercially continuous twenty-four hour power every day in the year except as provided in paragraph 6, having a periodicity of approximately 60 cycles per second, and shall be delivered as aforesaid at a voltage suitable for distribution within the municipality.

(a) That the meters with their series and potential transformers shall be connected at the point of delivery, and shall be subject to test as to accuracy by either party hereto.

(b) The maintenance by the Commission of approximately the agreed voltage at approximately the agreed frequency at the point of delivery to the Corporation shall constitute the supply of all power involved herein and the fulfilment of all operating obligations hereunder; and when voltage and frequency are so maintained, the amount of power, its fluctuations, load factor, power factor, distribution as to phases, and all other electric characteristics and qualities are under the sole control of the Corporation, their agents, customers, apparatus, appliances and circuits.

5. The engineers of the Commission, or one or more of them, or any other person or persons appointed for this purpose by the Commission, shall have the right from time to time during the continuance of this agreement, to inspect the apparatus, plant and property of the Corporation and take records at all reasonable hours.

6. In case the Commission should at any time or times be prevented from supplying said power, or any part thereof, or in case the Corporation shall at any time be prevented from taking said power, or any part thereof, by strike, lock-out, fire, invasion, explosion, act of God, or the King's enemies, or any other cause reasonably beyond their control, then the Commission shall not be bound to deliver such power during such times, and the Corporation shall not be bound to pay the price of said power, during such times.

7. The Commission shall at least annually adjust and apportion the amounts payable by Municipal Corporations for such power and such interest, sinking fund, line loss, and cost of operating, maintaining, repairing, renewing and insuring the line and works.

8. It is hereby declared that the Commission is to be a trustee of all property held by the Commission under this agreement for the Corporation and other Municipal Corporations supplied by the Commission, but the Commission shall be entitled to a lien upon said property for all moneys expended by the Commission under this agreement and not repaid. At the expiration of this agreement the Commission shall determine and adjust the rights of the Corporation and other Municipal Corporations, supplied by the Commission, having regard to the amounts paid by them respectively, under the terms of this agreement, and such other considerations as may appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

9. If at any time any other Municipal Corporation or, pursuant to said Act, any railway or distributing company, or any other Corporation or person, applies to the Commission for a supply of power, the Commission shall notify the applicant and the Corporation in writing, of a time and place and hear all representations that may be made as to the terms and conditions for such supply.

Without discrimination in favor of the applicants as to the price to be paid, for equal quantities of power, the Commission may supply power upon such terms and conditions as may, having regard to the risk and expense incurred, and paid, and to be paid by the Corporation, appear equitable to the Commission, and are approved by the Lieutenant-Governor in Council.

10. In case any Municipal Corporation, or any person, firm or Corporation, which shall contract with the Commission or any Municipal Corporation, for a supply of power furnished to the Commission by a power company shall suffer damages by the act or neglect of the company, and such Municipal Corporation, person, firm or Corporation would, if the Company had made the said contracts directly with them, have had a right to recover such damages or commence any proceedings or any other remedy, the Commission shall be entitled to commence such proceedings to bring such action for or on behalf of such Municipal Corporation, person, firm or Corporation, and notwithstanding any act, decision or rule of law to the contrary, the Commission shall be entitled to all the rights and remedies of such Municipal Corporation.

person, firm or Corporation including the right to recover such damages, but no action shall be brought by the Commission until such Municipal Corporation, person, firm or Corporation shall have agreed with the Commission to pay any costs that may be adjudged to be paid if such proceedings or action is unsuccessful. The rights and remedies of any such Municipal Corporation, person, firm or Corporation shall not be hereby prejudiced.

11. If differences arise between Corporations to whom the Commission is supplying power, the Commission may upon application fix a time and place to hear all representations that may be made by the parties and the Commission shall, in a summary manner, when possible, adjust such differences and such adjustment shall be final.

The Commission shall have all the powers that may be conferred upon a Commissioner appointed under the *Act Respecting Enquiries Concerning Public Matters*.

12. This agreement shall extend to, be binding upon and enure to the benefit of the successors and assigns of the parties hereto.

In witness whereof the Commission and the Corporation have respectively affixed their corporate seals and the hands of their proper officers.

#### HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

(SEAL.)

A. BECK, *Chairman*.

W. W. POPE, *Secretary*.

#### MUNICIPAL CORPORATION OF THE TOWNSHIP OF WHITBY.

(SEAL.)

FRED. F. ROWE, *Reeve*.

D. HOLLIDAY, *Clerk*.

#### SCHEDULE "T."

This agreement made this 27th day of September, A.D. 1917,

Between

The Hydro-Electric Power Commission of Ontario, herein called the "Commission," party of the first part;

and

The Municipal Corporation of the Township of East Whitby, herein called the "Corporation," party of the second part.

Whereas, pursuant to an Act to provide for the transmission of electrical power to municipalities, the Corporation applied to the Commission for a supply of power;

And whereas the Corporation under the provisions of *The Power Commission Act* and amendments thereto and *The Power Commission Act*, Revised Statutes of Ontario, 1914, chapter 39, part 2, being "An Act to Provide for the Supply of Electrical Energy or Power to Individual Users," and *The Central Ontario Power Act, 1916*, 6 Geo. V, chap. 8, has, at the request of a number of ratepayers (petitioners) applied to the Commission for a supply of electrical power or energy, and has passed a by-law, No. 826, to authorize the execution of an agreement therefor;

And whereas the Commission has entered into contracts with power companies for such power, or has acquired or constructed generating plants, transformer stations, transmission lines, distributing stations and other works necessary for the delivery of electrical energy or power to municipalities.

Now, therefore, this Indenture witnesseth that in consideration of the premises and of the agreement herein set forth, subject to the provisions of the said Act and amendments thereto, the parties hereto agree each with the other as follows:

1. The Commission agrees:

(a) To reserve and deliver at the earliest possible date electrical power to the Corporation as required by the Corporation.

(b) At the expiration of thirty (30) days' notice in writing which may be given by the Corporation from time to time during the continuance of this agreement, to reserve and deliver to the Corporation additional electrical power as may be required from time to time.

(c) To use at all times first class, modern, standard commercial apparatus and plant, and to exercise all due skill and diligence so as to secure the most perfect operation of the plant and apparatus of the Corporation.

(d) Power shall be delivered to the Corporation at approximately 2,200 or 4,000 volts, or at any other primary voltage that may be available for the Corporation's use.

(e) To supply and construct all 2,200 and 4,000 or other lines at primary voltage made necessary by contracts for electric service made between the Corporation and residents or users, within the township, from the Commission's transformer station or stations to the service transformers of the Corporation, located at such points as the Commission may approve.

2. The Corporation agrees:

(a) To use all diligence by every lawful means in its power to prepare for the receipt and use of the power dealt with by this agreement, so as to be able to give notice as specified in paragraph 1 (b).

(b) Subject to the provisions of paragraph 2 (g) herein, to pay to the Commission monthly, for all power taken, the cost of the power delivered to the Commission, plus the charges in connection with the delivery of the power to the municipality as outlined in clauses 2 (c) and (d).



(c) To pay, annually, in twelve monthly instalments, interest upon its proportionate part of the moneys expended by the Commission on capital account for the acquiring of properties and rights, and acquiring and construction of generating plants, transformer stations, transmission lines, distributing stations and other necessary works for the delivery of power to the Corporation; to pay an annual sum for its proportionate part of all moneys expended by the Commission on capital account for the acquiring of the said properties and rights, and the cost of the said construction, so as to form in thirty years a sinking fund for the retirement of securities issued by the Province of Ontario; and to bear its proportionate part of the line loss, and pay its proportionate part of the cost to operate, maintain, repair, renew, and insure the said lines, generator and transformer stations and works. All payments under that paragraph shall be subject to adjustment under paragraph 7.

(d) In addition to the cost of power, and the cost of delivering it to the Corporation as provided for in paragraphs 2 (b) and (c), to pay to the Commission in half yearly instalments, interest and sinking fund on a thirty year basis on all capital invested by the Commission in 2,200, 4,000 or other lines of primary voltage as provided for in paragraph 1 (e), and to maintain, repair, renew and operate the said lines, and set aside a depreciation fund at the rate of 5 per cent. per annum on all capital expended by the Commission on such construction.

(e) The amounts payable in accordance with clause 2 (b), (c) and (d) shall be paid in gold coin of the present standard of weight and fineness, at the office of the Commission at Toronto, and bills shall be rendered by the Commission on or before the 5th day and paid by the Corporation or or before the 15th day of each month, except that payments under clause 2 (d) shall be made half yearly. If any bill remains unpaid for fifteen days, the Commission may, in addition to all other remedies and without notice, discontinue the supply of power to the Corporation until said bill is paid. No such discontinuance shall relieve the Corporation from the performance of the covenants, provisoes and conditions herein contained. All payments in arrears shall bear interest at the legal rate.

(f) To take power exclusively from the Commission during the continuance of this agreement.

(g) To pay for three-fourths of the power ordered from time to time by the Corporation and held in reserve for it as herein provided, whether it takes the same or not.

When the highest average amount of power taken for any twenty consecutive minutes during any month shall exceed during the twenty consecutive minutes three-fourths of the amount ordered by the Corporation and held in reserve, then the Corporation shall pay for this greater amount during the entire month.

If the Corporation during any month takes more than the amount of power ordered and held in reserve for it, as determined by an integrated peak, or highest average, for a period of twenty consecutive minutes, the Corporation shall pay for this greater amount of power during the entire month. The taking of such excess shall thereafter constitute an obligation on the part of the Corporation to pay for and on the part of the Commission

to hold in reserve an additional block of power in accordance with the terms and conditions of this contract.

When the power factor of the greatest amount of power taken for said twenty consecutive minutes falls below 90%, the Corporation shall pay for 90% of said power divided by the power factor.

(h) To use at all times first class, modern, standard commercial apparatus and plant to be approved by the Commission and to exercise all due skill and diligence so as to secure the most perfect operation of the plant and apparatus of the Commission and of the company.

(i) To co-operate, by all means in its power, at all times, with the Commission, to increase the quantity of power required from the Commission, and in all other respects to carry out the objects of this agreement and of the said Act.

3. This agreement shall remain in force for thirty (30) years from the date of the first delivery of power under this contract.

4. The power shall be three-phase, alternating, commercially continuous twenty-four hour power every day in the year except as provided in paragraph 6, having a periodicity of approximately 60 cycles per second, and shall be delivered as aforesaid at a voltage suitable for distribution within the municipality.

(a) That the meters with their series and potential transformers shall be connected at the point of delivery, and shall be subject to test as to accuracy by either party hereto.

(b) The maintenance by the Commission of approximately the agreed voltage at approximately the agreed frequency at the point of delivery to the Corporation shall constitute the supply of all power involved herein and the fulfilment of all operating obligations hereunder; and when voltage and frequency are so maintained, the amount of the power, its fluctuations, load factor, power factor, distribution as to phases, and all other electric characteristics and qualities are under the sole control of the Corporation, their agents, customers, apparatus, appliances and circuits.

5. The engineers of the Commission, or one or more of them, or any other person or persons appointed for this purpose by the Commission, shall have the right from time to time during the continuance of this agreement, to inspect the apparatus, plant and property of the Corporation and to take records at all reasonable hours.

6. In case the Commission should at any time or times be prevented from supplying said power, or any part thereof, or in case the Corporation shall at any time be prevented from taking said power, or any part thereof, by strike, lockout, fire, invasion, explosion, act of God, or the King's enemies, or any other cause reasonably beyond their control, then the Commission shall not be bound to deliver such power during such times, and the Corporation shall not be bound to pay the price of said power, during such time.

7. The Commission shall at least annually adjust and apportion the amounts payable by Municipal Corporations for such power and such interest,

sinking fund, line loss, and cost of operating, maintaining, repairing, renewing and insuring the line and works.

8. It is hereby declared that the Commission is to be a trustee of all property held by the Commission under this agreement for the Corporation and other Municipal Corporations supplied by the Commission, but the Commission shall be entitled to a lien upon said property for all moneys expended by the Commission under this agreement and not repaid. At the expiration of this agreement the Commission shall determine and adjust the rights of the Corporation and other Municipal Corporations, supplied by the Commission, having regard to the amounts paid by them, respectively, under the terms of this agreement, and such other considerations as may appear equitable to the Commission and are approved by the Lieutenant-Governor in Council.

9. If at any time any other Municipal Corporation, pursuant to said Act, any railway or distributing company, or any other Corporation or person, applies to the Commission for a supply of power, the Commission shall notify the applicant and the Corporation in writing of a time and place and hear all representations that may be made as to the terms and conditions for such supply.

Without discrimination in favor of the applicants as to the price to be paid, for equal quantities of power, the Commission may supply power upon such terms and conditions as may, having regard to the risk and expense incurred, and paid, and to be paid by the Corporation, appear equitable to the Commission, and are approved by the Lieutenant-Governor in Council.

10. In case any Municipal Corporation or any person, firm or Corporation, which shall contract with the Commission or any Municipal Corporation, for a supply of power furnished to the Commission by a power company, shall suffer damages by the act or neglect of the company, and such Municipal Corporation, person, firm or Corporation would, if the company had made the said contracts directly with them, have had a right to recover such damages or commence any proceedings or any other remedy, the Commission shall be entitled to commence any such proceedings to bring such action for or on behalf of such Municipal Corporation, person, firm or Corporation, and notwithstanding any act, decision or rule of law to the contrary, the Commission shall be entitled to all the rights and remedies of such Municipal Corporation, person, firm or Corporation, including the right to recover such damages, but no action shall be brought by the Commission until such Municipal Corporation, person, firm or Corporation shall have agreed with the Commission to pay any costs that may be adjudged to be paid if such proceedings or action is unsuccessful. The rights and remedies of any such Municipal Corporation, person, firm or Corporation shall not hereby be prejudiced.

11. If differences arise between Corporations to whom the Commission is supplying power, the Commission may upon application fix a time and place to hear all representations that may be made by the parties and the Commission shall, in a summary manner, when possible, adjust such differences and such adjustment shall be final.

The Commission shall have all the powers that may be conferred upon a Commissioner appointed under the *Act Respecting Enquiries Concerning Public Matters*.

12. This agreement shall extend to, be binding upon and enure to the benefit of the successors and assigns of the parties hereto.

In witness where of the Commission and the Corporation have respectively affixed their corporate seals and the hands of their proper officers.

HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO.

A. BECK, *Chairman.*

(SEAL.)

W. W. POPE, *Secretary.*

MUNICIPAL CORPORATION OF THE TOWNSHIP OF EAST WHITBY.

WARREN DEARBORNE, *Reeve.*

(SEAL.)

WM. PURVIS, *Clerk.*

SCHEDULE "U."

Agreement made this twelfth day of April, A.D. 1917,

Between

John Joseph Allbright, of Buffalo, in the State of New York, on behalf of himself and other Stockholders of The Ontario Power Company of Niagara Falls, hereinafter called the "Vendor," of the first part;

and

The Hydro-Electric Power Commission of Ontario, hereinafter called the "Purchaser," of the second part;

and

His Majesty, the King, herein represented by the Lieutenant-Governor in Council of the Province of Ontario, acting by Sir William Hearst, Prime Minister of the said Province, hereinafter called the "Guarantor," of the third part;

and

The Ontario Power Company of Niagara Falls, hereinafter called the "Power Company," of the fourth part;

and

The Ontario Transmission Company, Limited, hereinafter called the "Transmission Company," of the fifth part;

and

Niagara, Lockport and Ontario Power Company, hereinafter called the "Lockport Company," of the sixth part.



Whereas, the Power Company has an issued and outstanding capital stock of Ten Million Dollars (\$10,000,000) par, amount represented by One Hundred Thousand shares of the par value of One Hundred Dollars (\$100.00) each—

Now this agreement witnesseth that, in consideration of the covenants, agreements and considerations herein contained, the parties respectively covenant and agree the one with the other as follows:

#### APPENDIX C.

FIRST: The Vendor agrees to sell to the Purchaser and the Purchaser agrees to purchase from the Vendor, ninety thousand (90,000) shares of the par value of one hundred dollars (\$100.00) each, of the capital stock of the Power Company and the remaining ten thousand (10,000) shares of said stock of the par value of one million dollars (\$1,000,000) to the extent that the holders thereof put the Vendor in a position to make delivery of such shares to the Purchaser prior to the time for completion as hereinafter defined.

SECOND: The consideration for the said sale shall be:

(a) The sum of eight million dollars (\$8,000,000), or such portion of said sum as shall equal eighty per cent. (80%) of the par amount of the shares of said stock of the Power Company transferred and delivered to the Purchaser at the time for completion as hereinafter defined, which sum the Purchaser hereby agrees to pay and satisfy by the issue and delivery to the Vendor of the debentures of the Purchaser guaranteed as hereinafter provided for, bearing date on the date of the said time for completion in such denominations being multiples of one hundred (\$100.00) dollars as the Vendor shall require, payable forty years from the said date and bearing interest at the rate of four per cent. (4%) per annum, payable half-yearly, said debentures being payable as to principal and interest in Toronto, Canada; New York, United States of America, and/or London, England, at the option of the holders; the said debentures as to both principal and interest to be payable in gold coin of the present standard of weight and fineness of the country where same shall be paid; and, unless otherwise agreed between the Vendor and the Purchaser, interest coupons to be attached to said debentures and the coupons attached thereto to be in the forms set out in Schedule "A" to this agreement, or to the like effect with any variations or additions which the Vendor may before the time for completion required to secure listing and quotation of same on any exchange or exchanges; said debentures and coupons to be engraved or lithographed, the debentures to be sealed with the seal of the Purchaser and signed by the Chairman and Secretary, and the coupons to be signed by the Secretary; the signature of the coupons to be either written or lithographed or engraved as the Purchaser may determine. Provided that in lieu of delivering at the time for completion said lithographed or engraved debentures the Purchaser may issue and deliver interim debentures with or without coupons, such interim debentures and coupons, if any, to be in such form and in such denomination as the Vendor may be willing to accept and to be guaranteed as to principal and interest in the same manner as is provided for in respect of said lithographed or engraved debentures, and to entitle the holder or holders thereof to said lithographed or engraved debentures as soon as the same are prepared in exchange for an equal amount of said interim debentures and to give the

holder or holders thereof, or of any coupons attached thereto pending such exchange every right which the holder or holders of said lithographed or engraved debentures would have; and if interim debentures are delivered, the said lithographed or engraved debentures shall be prepared and made ready to be exchanged therefor within two months from the time for completion as hereinafter defined, and shall be exchanged for said interim debentures as and when said interim debentures are delivered to the Purchaser after said lithographed or engraved debentures are so prepared and made ready; and

(b) The execution and delivery by the Purchaser of an agreement with the Vendor and the Toronto General Trusts Corporation, which, unless otherwise agreed between the Vendor and the Purchaser, shall be in the form set out in Schedule "B" of this agreement, and which the Purchaser agrees with the Vendor to execute and deliver at the time for completion as hereinafter defined.

THIRD: It is understood between the Vendor and the Purchaser, and the Purchaser agrees with the Vendor, that before the time for completion as hereinafter defined, the Vendor may cause or procure the Power Company to do and the Power Company may do all such things as may be requisite or proper to be done so that at the time for completion as hereinafter defined the respective assets of the Power Company and the Transmission Company will consist only of those described in Schedule "C" to this agreement. And it is further understood between the Vendor and the Purchaser, and the Vendor agrees with the Purchaser that the Vendor will cause or procure the Power Company and the Transmission Company to do all such things as may be required or proper to be done so that the respective liabilities (whether direct, indirect, contingent, accruing or accrued) of the said companies at the time for completion as hereinafter defined, shall be only those described in Schedule "D" to this agreement, and in default of so doing or in so far as he shall not so do the Vendor will pay or settle all such liabilities.

The Power Company and the Purchaser severally agree with the Vendor that should the Power Company and/or the Transmission Company before the time for completion have sold or assigned any assets of either Company, such as accounts receivable or other choses in action, and should such assets not have been collected or reduced to possession by the owner or owners thereof, the Power Company and/or the Transmission Company will, from time to time, at the request and expense of the Vendor, use all reasonable means to collect and get in such of said assets or the proceeds thereof as the Vendor may specify, and will account for and pay and deliver over such assets or proceeds, as the case may be, from time to time received by the Power Company and/or the Transmission Company to the Vendor or the person or persons respectively entitled thereto.

The Vendor agrees with the Power Company and the Purchaser that in addition to the assets set out in said Schedule "C" hereto, there shall be left in the hands of the Power Company at the time for completion a sum estimated by the Vendor to be equal to—

(a) Interest and Sinking Fund payments on the bonds and debentures of the Power Company and the Transmission Company mentioned in the said Schedule "D" which shall have accrued but shall not be due at the time for completion, and

(b) The proper proportion of all rentals and payments to the Commissioners of the Queen Victoria Niagara Falls Park, and of all unpaid rates, taxes and assessments for the year 1917, adjusted to the time for completion, and if such estimate shall, after completion, prove inaccurate, the excess or deficiency when determined shall be paid by the Vendor to the Power Company, or by the Power Company or the Purchaser to the Vendor as the case may require.

The assets of the Power Company at the time for completion are not intended to include any rentals, sums or moneys payable or to become payable for power supplied or otherwise, under any lease or contract which shall have accrued or shall have been earned, but shall not be due or payable at the time for completion, and if they do include any such items the Purchaser shall use every reasonable effort to collect such items, and if and when collected shall pay, or procure to be paid, to the Vendor, the amount thereof adjusted to the time for completion, and the Purchaser shall also at the time for completion pay or procure to be paid to the Vendor the value of all pre-paid insurance, rentals, taxes, rates (including local improvement rates), assessments and payments for telephone services adjusted to the time for completion.

FOURTH: The Purchaser shall have thirty days from the date hereof within which to examine the real property titles of the Power Company and of the Transmission Company. The Vendor shall not be obliged to deliver any abstract or title or to incur any expense in connection with the investigation of said titles, but the Purchaser shall search the said titles entirely at its own expense. The Vendor will permit the Purchaser or procure the Purchaser to be permitted to inspect all documents relating to the titles which may be in the possession or power of the Power Company or the Transmission Company. If any objection or requisition in respect of said titles shall be made by the Purchaser which the Vendor may from any reason whatsoever be unwilling to comply with or to remove whether able to do so or not, the Vendor shall have the right to rescind this agreement by written notice to the Purchaser, of his election to do so, and such right may be exercised notwithstanding any attempt to remove or to comply with or any partial removal or compliance with any such objection or requisition, and notwithstanding any negotiations which may have been had between the parties with reference thereto. If the Purchaser shall not have made any specific requisition or objection to the said titles within the said period of thirty days, or if all specific requisitions or objections made within the said period of thirty days shall have been removed or complied with or waived, the Purchaser shall be deemed to have accepted the titles of the Power Company and of the Transmission Company; provided always that the Purchaser may waive all such objections or requisitions by giving notice in writing to that effect to the Vendor at any time within fifteen days from the receipt of such notice of rescission and upon such notice of waiver being given this agreement shall remain in full force and effect as though such objections or requisitions had never been made.

FIFTH: Upon the completion of the sale under this agreement, the Vendor agrees that he will tender or cause to be tendered the resignation of all members of the Boards of Directors of the Power Company and of the Transmission Company, and also that he will tender or cause to be tendered the resignation of all officers of said companies respectively, or will terminate, or cause to be terminated, their employment, and that the Boards of Direc-



tors of the Power Company and of the Transmission Company will at that time respectively assist the Purchaser in acceptance of such resignations and in the election of new directors nominated by the Purchaser.

SIXTH: The Vendor agrees that the Power Company and the Transmission Company will, until the time for completion as hereinafter defined, repair and keep in repair and in good working order and condition, reasonable wear and tear only excepted, all the present buildings, erections, plant, machinery and fixtures of said company and all additions thereto, and will, pending said time for completion, and except as otherwise expressly provided for herein, carry on the respective businesses of said companies in the usual and ordinary manner, but in case of loss or damage which would involve an expenditure of more than two hundred and fifty thousand dollars (\$250,000) shall occur, the Vendor may, by notice in writing addressed to the Purchaser, rescind this agreement, unless the Purchaser shall, by notice in writing, waive the above covenants to repair, rebuild or make good and agree to accept in lieu thereof, an assignment of the rights of the Vendor, the Power Company and the Transmission Company, or of any one of more of them (if any) to such insurance moneys as may be payable in respect thereof; provided that shall not, nor shall the Power Company or the Transmission Company proceed with any such repairs, rebuilding or making good until one week after it shall have submitted the plans thereof to the Purchaser and shall have considered any representations or suggestions which the Purchaser may make in respect thereof. In case there shall be an obligation to repair, rebuild and make good under the foregoing provisions, and the Vendor shall not have rescinded this agreement under the provisions of this clause, the completion of this agreement shall not be thereby delayed, but the assets of the Power Company will be restored by the inclusion therein of a sum estimated in good faith by the Vendor to be equal to the reasonable cost of such repair, rebuilding, or making good, or so much thereof as shall not have been finished or paid for at the time of completion, and should said sum prove to be less than such reasonable cost the difference when determined shall be paid by the Vendor to the Power Company. Neither the Vendor, the Power Company nor the Transmission Company shall be obliged to make any betterments or improvements to the property of either company, but if any such improvements shall be deemed expedient by either company, the Vendor shall cause the Purchaser to be notified in case the expenditure in respect of any one item shall exceed five hundred dollars (\$500.00) and the Purchaser shall pay the Vendor in cash at the time for completion as hereinafter defined, a portion of all expenditures made by either company for the betterment or improvement of the property of either company from the date hereof up to said time for completion in respect of,—

(a) Items not exceeding five hundred dollars (\$500.00) and

(b) All items exceeding five hundred dollars (\$500.00) in respect of which the Purchaser shall have consented to the expenditure in writing which portion shall bear the same proportion to the total amount of such expenditure as the amount of stock of the Power Company delivered to the Purchaser in completing this agreement bears to the total issued capital stock of the Power Company.

The Vendor agrees with the Purchaser that until the time for completion, as hereinafter defined, neither the Power Company nor the Transmission Company will surrender any of the franchise rights or privileges granted



to them, or either of them, or do omit or permit to be done or omitted any act or thing whereby any such particular rights or privileges may become forfeited or terminated, or liable to forfeiture or termination.

SEVENTH: The Guarantor agrees with the Vendor and the Purchaser and each of them to guarantee and hereby guarantees to the respective holders thereof for the time being the due payment by the Purchaser of the interest and principal of all debentures of the Purchaser to be delivered under the terms of this agreement, and the Guarantor further agrees that a guarantee duly executed by the Guarantor and guaranteeing to the Holder thereof for the time being payment of the interest and principal thereof by the Purchaser, shall be endorsed upon each of said debentures of the Purchaser so to be delivered prior to the delivery thereof hereunder, such guarantee, unless altered by consent, to be in the form set out in Schedule "A" to this agreement or to the like effect; and the Guarantor further agrees with the Vendor and the Purchaser, and each of them, to guarantee and hereby guarantees to the Vendor and to the Toronto General Trusts Corporation and its successors and assigns the due performance and observance by the Purchaser of the agreement between the Purchaser and the Vendor and The Toronto General Trusts Corporation to be executed by the Purchaser under the provisions of clause (b) of the second section of this agreement.

EIGHTH: The Lockport Company, the Power Company and the Purchaser mutually agree:—

(a) That on the first day of April, 1950, if all the now outstanding bonds of the Lockport Company shall have been paid and retired on or before that date, and otherwise as soon after the first day of April, 1950, as all of the said bonds of the Lockport Company shall have been paid and retired, and in any event not later than the first day of November, 1954, the existing contract between the Power Company and the Lockport Company, evidenced by four agreements made between the Lockport Company and the Power Company, and dated, respectively, the 16th day of July, 1904; the 30th day of December, 1904; the 21st day of October, 1905, and the 30th day of December 1913, (hereinafter called the existing power supply contract) and any extension or renewal of or right of either party thereto to extend or renew the same shall cease and determine; and

(b) That in case the Power Company shall at any time or times be prevented by any competent authority other than the Legislature or Government of the Province of Ontario, or by strike, lockout, riot, fire, invasion, explosion, act of God or the king's enemies, or any other cause, reasonably beyond its control, from delivering to the Lockport Company the power deliverable under the existing Power supply contract, or any extension or renewal thereof, or any part of such power, or in case the Lockport Company shall at any time be so prevented from taking such power or any part thereof, then the Power Company shall not be bound to deliver such power during such time or times or be liable for any penalties or damages or deductions for non-delivery during such time or times, and the Lockport Company shall not be bound to pay for such power during such time or times, but as soon as the cause of such interruption is removed, the Power Company shall, without any delay, deliver the said power as aforesaid, and the Lockport Company shall take the same, and each of the said parties (the Power Company and the Lockport Company) shall, so far as such party can do so, and as

early as possible, remove and overcome such causes or causes of interruption.

The Lockport Company covenants with the Power Company and the Purchaser, and each of them, that all the said bonds of the Lockport Company will be paid and retired before or on the first day of November, 1954.

The Power Company agrees with the Lockport Company and the Purchaser agrees with and guarantees to the Lockport Company, and agrees with and guarantees to the Vendor that the Power Company will duly abide by, observe and perform the existing power supply contract between the Power Company and the Lockport Company (as varied by this agreement) and all extensions or renewals thereof; and the Purchaser and the Guarantor undertake and agree with the Power Company, the Lockport Company, the Transmission Company and the Vendor, to use their best endeavours from time to time with the Government and Parliament of Canada and with the Legislature of Ontario to place and keep the Power Company and the Transmission Company at all times in such a position that they and each of them may lawfully carry out the terms of the existing power supply contract between the Power Company and the Lockport Company (as varied by this agreement) and any extensions or renewals thereof so far as relates to the export of the power required for the purpose of such contract, as so varied, and any extensions or renewals thereof.

The Purchaser, the Power Company and the Lockport Company mutually agree that except as by this paragraph (eighth) varied, the existing power supply contract shall continue and remain in full force and effect.

NINTH: This agreement shall not take effect or be binding upon the parties hereto unless and until it shall have been executed and delivered by all the said parties.

TENTH: The Vendor agrees with the Purchaser that neither the Power Company nor the Transmission Company will, before the time for completion as hereinafter defined, create or issue any further shares or their capital stocks, respectively, or any bonds, debentures or like securities.

ELEVENTH: The Vendor agrees with the Purchaser that the Vendor will, from time to time, after the completion of this Agreement, upon the request and at the expense of the Purchaser, furnish to the Purchaser any and all information in connection with any and all of the affairs of the Power Company and the Transmission Company which the Vendor may have in his possession or under his control.

TWELFTH: The time for completion of this agreement shall be the first day of the calendar month which shall fall next after sixty (60) days from the execution and delivery of this agreement by all the parties thereto, and if such execution and delivery shall not have taken place by the first day of June, 1917, this agreement shall be void; provided that the Vendor and Purchaser may agree in writing to an extension or extensions of the said date, and of the said time for completion, or either of them, and every such agreement shall be binding on all parties hereto, and if and as often as the time for completion shall be extended the time to which it is extended shall thereafter be taken to be the time for completion for the purposes of this agreement.

THIRTEENTH: The completion of this agreement shall take place at the office of the Purchaser at Toronto, Ontario.

FOURTEENTH: The Power Company and the Transmission Company assent, and each of them assents, to this agreement, and the Power Company and the Transmission Company agree, and each of them agrees, with the Vendor that they and each of them will, at the expense of the Vendor, facilitate in all reasonable ways the due carrying out of all the terms of this agreement to be carried out by the Vendor, and that they and each of them on its part will do and cause to be done all such acts and things as the Vendor hereby agrees to cause or procure to be done by the Power Company and the Transmission Company or either of them.

FIFTEENTH: Time shall be of the essence of this agreement.

SIXTEENTH: The obligations of the Guarantor hereunder shall extend to his successors; and the obligations of every other party hereunder shall bind the successors and assigns of such party if a corporation, and the executors, administrators and assigns of such party if a person; and all rights of and benefits to any party hereunder shall extend and enure to the successors and assigns of such party if a corporation, and to the executors, administrators and assigns of such party if a person.

In witness whereof these presents have been duly executed by the parties hereto the day and year first above written.

Witness:

(Signed) W. K. KOESTER.

(Signed) JOHN JOSEPH ALBRIGHT,

The Hydro-Electric Power  
Commission of Ontario.

(Signed) A. BECK, *Chairman*.

(Signed) W. W. POPE, *Secretary*.

(Signed) J. W. JENKINS.

(Signed) W. H. HEARST, *Prime Minister*.  
The Ontario Power Com-  
pany of Niagara Falls.

By

JOHN JOS. ALBRIGHT, *President*.  
ROBERT C. BOARD, *Secretary*.

The Ontario Transmission  
Company of Niagara Falls.

By

JOHN JOS. ALBRIGHT, *President*.  
ROBERT C. BOARD, *Secretary*.

Niagara, Lockport and On-  
tario Power Company.

By

FRED. D. COREY, *President*.  
HARRY E. NICHOLS, *Secretary*.

SCHEDULE "A" REFERRED TO IN THE ANNEXED  
AGREEMENT.

FORM OF DEBENTURE.

\$.....  
£.....  
No.....

The Hydro-Electric Power Commission of Ontario (hereinafter called "the Commission") for value received, hereby promises to pay to the bearer, or if registered, to the registered holder hereof, on the ..... day of ..... 19 , on presentation and surrender of this debenture, the sum of ..... dollars, at ..... in Toronto, Canada, or at ..... in New York, United States of America, or the sum of ..... pounds sterling, at ..... in London, England, at the holder's option, with interest thereon, until paid, at the rate of four per centum per annum, payable half-yearly, at any of said places, at the holder's option, on the first of ..... and the first day of ..... in each year, on presentation and surrender of the interest coupons hereto annexed as they severally become due; each payment of principal and interest to be made in gold coin of the present standard of weight and fineness of the country where same shall be made.

This debenture shall pass by delivery, but may be registered as to principal in the name of the holder in a register which shall be kept by the Commission at its office in Toronto, Canada, in which case it can only be transferred by an instrument in writing, signed by the registered holder or his lawful attorney, and registered in the said register. A transfer to bearer may subsequently be registered, after which this debenture shall be transferable by delivery alone until again registered in the name of the holder. Notwithstanding registration, the interest coupons shall continue payable to bearer.

This debenture is issued under the authority of an Act of the Legislative Assembly of the Province of Ontario, entitled ..... and being Chapter ..... of the Statutes of Ontario (1917) passed in the seventh year of the reign of His Majesty King George V.

In witness whereof the Commission has caused its corporate seal to be hereunder affixed and this debenture to be signed by ..... and ..... this ..... day of ..... 19 .

(Seal)

.....  
.....



## FORM OF INTEREST COUPON.

Debenture No. ....

Interest Coupon No. ....

The Hydro-Electric Power Commission of Ontario will pay to the bearer on the ..... day of ..... dollars at .....  
 ..... in Toronto, Canada, or at ..... in New York,  
 United States of America, or ..... pounds sterling, at  
 ..... in London, England, at the bearer's option; such pay-  
 ment to be made in gold coin of the present standard of weight and fineness  
 of the country where same shall be made and being the half-year's interest  
 on debentures No. .... payable on the .....  
 day of ..... 19 .

Dated the ..... day of ..... 19 .

## FORM OF GUARANTEE FOR ENDORSEMENT ON DEBENTURES.

By virtue of powers conferred by the Legislature of the Province of Ontario, Canada, the Province of Ontario hereby guarantees to the holder of the within bond for the time being and to the holder for the time being of any of the coupons attached thereto, due payment of the principal of the within debenture and of the interest thereon, according to the tenor of the said debenture and of the coupons attached thereto.

## SCHEDULE "B" REFERRED TO IN THE ANNEXED AGREEMENT.

This agreement made this Twelfth day of April, A.D., 1917.

Between

The Hydro-Electric Power Commission of Ontario, hereinafter called the "Commission," of the first part;

and

John Joseph Albright, of Buffalo, in the United States of America, hereinafter called the "Vendor," of the second part;

and

The Toronto General Trusts Corporation, representing and acting herein for the benefit of the various holders for the time being of the various bonds and debentures hereinafter mentioned, hereinafter called the "Trustees," of the third part.

WITNESSETH that—

FIRST: For divers valuable considerations and in consideration of one dollar (\$1.00) of lawful money of Canada, paid by the Vendor and the Trus-

## SCHEDULE "D" REFERRED TO IN THE ANNEXED AGREEMENT.

## LIABILITIES OF THE POWER COMPANY AND/OR THE TRANSMISSION COMPANY.

(a) First mortgage five per cent. bonds of the Power Company, and interest thereon, and sinking fund payments connected therewith; said bonds amounting on the 31st December, 1916, to the sum of nine million nine hundred and eighty-four thousand dollars (\$9,984,000), and all covenants, agreements, obligations and liabilities of the Power Company, in or under the mortgage dated 2nd February, 1903, between the Power Company and the Toronto General Trusts Corporation and/or the supplemental agreement, dated 1st October, 1908, between the Power Company and Francis Ralston Welsh and others, securing said bonds.

(b) Six per cent. (6%) gold coupon debentures of the Power Company and interest thereon and sinking fund payments connected therewith, said debentures amounting on the 31st December, 1916, to the sum of two million eight hundred and eighty thousand dollars (\$2,880,000), and all covenants, agreements, obligations and liabilities of the Power Company, in or under the indenture dated 30th June, 1906, made between the Power Company and the Toronto General Trusts Corporation and/or the second mortgage dated 2nd November, 1914, made between the Power Company and National Trust Company, Limited, securing said debentures.

(c) All obligations and liabilities of the Power Company as guarantors or otherwise in respect of the first mortgage gold bonds of the Transmission Company, including all such obligations and liabilities under any covenant, agreement or guarantee relating to said bonds.

(d) First mortgage five per cent. gold bonds of the Transmission Company, and interest thereon, and sinking fund payments connected therewith, said bonds amounting on the 31st December, 1916, to one million eight hundred and five thousand dollars (\$1,805,000), and all covenants, agreements, obligations and liabilities of the Transmission Company, in or under the mortgage dated August 16th, 1905, made between the Transmission Company and the Toronto General Trusts Corporation, and/or two certain agreements, the one dated 20th April, 1910, made between the Power Company, the Transmission Company, the Toronto General Trusts Corporation, and the Holders from time to time of the five per cent. first mortgage gold bonds of the Transmission Company, and the other dated 11th June, 1910, made between the Transmission Company, the Standard Trust Company of New York, the Power Company and the Holders from time to time of the said first mortgage gold bonds of the Transmission Company.

(e) All obligations and liabilities of the Power Company and/or the Transmission Company under any and all contracts or agreements between the Power Company and/or the Transmission Company and the Commissioners of the Queen Victoria Niagara Falls Park.

(f) All obligations and liabilities of the Power Company and/or the Transmission Company under all power supply contracts (whether made originally by the Power Company and/or the Transmission Company or otherwise), with the following parties:—

Niagara, Lockport and Ontario Power Company,  
Canadian Steel Foundries, Limited,  
Canada Cement Company, Limited,  
Canadian Ramapo Iron Works,  
Electro-Metals, Limited,  
Department of Railways and Canals,  
Coniagas Reduction Company,  
American Cyanamid Company,  
Town of Merritton,  
Hydro-Electric Power Commission,  
The Norton Company,  
Dain Manufacturing Company, Limited,  
Cronmiller & White Brewing Company,  
C. Reichman & Son,  
James Battle,  
Page, Hersey Iron Tube and Lead Company, Limited,  
The Robinson Bros. Cork Co., Limited,  
Ontario Paper Company, Limited,  
Charles T. Grantham (Empire Cotton Mills),  
Metals-Chemical, Limited,  
A. E. Augustine,  
Beaver Wood Fibre Company, Limited,  
Corporation of Port Colborne,  
Humberstone Village,  
Humberstone Summer Resort,  
H. J. Shore,  
Ideal Baking Company,  
Humberstone Shoe Company,  
P. Noxel,  
Woods & Son,  
R. A. Wilson,  
E. Reeb.

(g) All obligations and liabilities of the Power Company and/or the Transmission Company, under three contracts for the purchase of power from the Toronto Power Company of Ontario, Limited, dated respectively, September 5th, 1914; October 13th, 1915, and March 17th, 1916.

(h) All written contracts and engagements which the Power Company and/or the Transmission Company may make or enter into in the ordinary course of business prior to the time for completion.

(i) All leases and contracts for crossings, right-of-way and pole, wire, cable and transmission rights and privileges which the Power Company and/or the Transmission Company shall hold, possess or be liable for at the time for completion, and all liabilities and obligations in respect of rentals or otherwise thereunder.

(j) All assessments, rates and taxes, including local improvement rates.

(k) Obligation of Power Company for transmissions on all power sold to Ontario Paper Company, Limited, and Beaver Wood Fibre Company, Limited.

(l) All obligations and liabilities of the Power Company and/or the Transmission Company on contracts for telephone service.

(m) Any obligation or liability of the Power Company or of R. C. Board in connection with the mortgage on the house mentioned under letter (a) in Schedule "C" to the annexed agreement.

## RIGHT-OF-WAY

The work of the Right-of-Way Department for the past year has embraced practically all parts of the Province, owing to the ever increasing area over which the operations of the Commission are constantly being extended from year to year. During the past year a great many miles of low tension lines were built, for which it was necessary to secure pole and other rights; the construction of the Chippawa Power Development has also necessitated the continual acquiring of right-of-way in this district, and the taking over of the Essex County Light & Power System, and other lines, has resulted in a great many negotiations and dealings towards the proper carrying out of such matters,

The following is a resume of the work carried on by the department for the past year:

### High Tension Lines

The purchase of lands for right-of-way, and other purposes, during the year include the following:—

1. Lands required for the Chippawa-Queenston Development, including the right-of-way for the power canal and the construction and disposal railways and lands along the Chippawa Creek required in connection with dredging operations carried on for the purpose of deepening the channel of that stream.

This work is practically completed, with the exception of a few parcels along the Chippawa Creek between Chippawa village and Montrose.

2. Balance of Lands on Windsor Right-of-Way.—This work is now practically completed, there being only one outstanding claim on this whole right-of-way.

3. Section A.A.—Duplicate line from Niagara Falls to Dundas.—All outstanding claims on this line, with the exception of six have been disposed of during the year. Three of these still outstanding are due to title complications and will be closed soon.

4. Right-of-Way for second High Tension Line between Dundas and Toronto.—This has been completed, with the exception of some half dozen cases in the neighborhood of Burlington, which are held up awaiting the result of arbitration proceedings in the Porter Case. This is the only case in which the Commission has had to resort to arbitration in over six years.

5. Purchase of lines and equipment of the Essex County Light and Power Company, including real estate, in the Towns of Leamington, Essex, Kingsville, Amherstburg and the Village of Harrow.

6. Additional lands required for conduit lines at Falls View.

A large number of agreements for purchase of real estate have been entered into and completed, including over one hundred and twenty-five separate parcels.

In each case the titles have been carefully investigated, the necessary conveyances prepared, executions secured, the money paid over and the deeds and other necessary instruments registered.

### Low Tension Lines

The principal low tension lines under construction during the year were:—

1. Trenton to Picton.—Nearly all the poles for this line are located on private property, which necessitated the securing of nearly one hundred and fifty easements, covering approximately one thousand poles.

Less than one hundred pole rights remain to be settled.



2. Perth to High Falls.—A large number of poles on this line are also located on private property and a great many trees, including several pieces of bush, had to be settled for and removed. The right-of-way work on this line is also nearly completed.

3. Perth to Smith's Falls.

4. Merrickville to Smith's Falls.

5. Morrisburg to Cornwall.

6. Cornwall Sub-station to Toronto Paper Company's Sub-station.

The construction of the four last mentioned lines rendered it necessary that a large number of trees should be removed, or trimmed. This involved a great deal of negotiation with the owners, but the work has now been practically completed.

7. The taking over and putting in proper repair of the Essex County System rendered it necessary to secure tree trimming rights over all these lines. Also, in order to rearrange parts of the lines, pole rights had to be secured.

This work is being proceeded with very satisfactorily, and will be completed by spring.

8. St Thomas to Aylmer.—This line is located along the Talbot Road and involved considerable tree work.

9. Extension of tree rights had to be secured on many lines constructed in the early days of the Commission.

10. Many anchor and guy rights on lines previously constructed in various parts of the Province, particularly on the Eugenia and Central Ontario Systems, have been secured during the year.

## SECTION II

### TRANSMISSION SYSTEMS

#### LOW TENSION TRANSMISSION LINES

Up to October 31, 1918, there were completed by the Line Construction Department, 1,561.18 miles of low tension transmission lines of voltages varying from 2,200 to 46,000 volts.

The mileage of these lines is distributed among the various systems as follows:

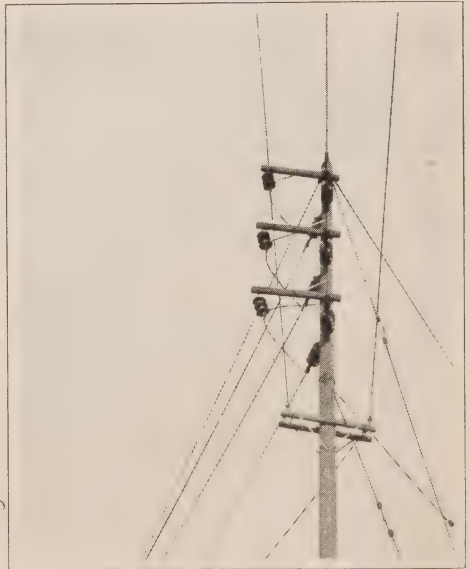
Niagara System .....	945.98
St. Lawrence System .....	66.35
Severn System .....	167.89
Wasdells System .....	65.85
Eugenia System .....	207.35
Muskoka System .....	26.32
Central Ontario System .....	64.94
Rideau System .....	16.50
	<hr/>
	1,561.18 miles

On October 31, 1918, there were under construction 98.27 miles of low tension lines of voltages varying from 4,000 to 44,000 volts.

The mileage of these lines is distributed among the various systems as follows:



Central Ontario System, 44,000 v. Kingston Line inside city limits No. 9228.



Kingston Line, 44,000 v. Dead ending of conductors at telephone crossing. No. 10972.

Niagara System .....	.....
St. Lawrence System .....	29.25
Severn System .....	.....
Wasdells System .....	.....
Eugenia System .....	2.50
Muskoka System .....	.....
Central Ontario System .....	28.27
Rideau System .....	38.25
	<hr/>
	98.27

In the construction of these lines, 10,805 miles of wire weighing 7,007,428 pounds, 72,856 wood poles and 442 steel towers were used. On the transmission line poles, 1,373.30 miles of single circuit telephone line has been erected for use in operating the system.

During the year an average of 11 gangs were employed by the Line Construction Department:

On transmission lines 3 pole-erecting gangs and 3 wire-stringing gangs were engaged.

On municipal distribution systems and rural line construction five gangs were engaged. These gangs constructed 165.23 miles of transmission lines as well as distribution systems in thirteen towns and villages and rural lines in three townships.

For the above lines 103 crossing plans were prepared and submitted to telephone and railway companies for approval.

Local distribution systems were constructed by the Commission in the towns and villages of: Alliston, Cookstown, Bradford, Beeton, Tottenham, Thornton, Elmwood, Tara, Hanover, Village of Scarboro Junction, Agincourt, Maple, Carlsruhe; Scarboro, Etobicoke, and Vaughan townships.

#### Wood Pole Transmission Lines 12,000 to 44,000 Volts

One hundred and sixty-five and one-quarter miles of transmission lines were completed during the past year and  $98\frac{1}{4}$  miles were under construction at the close of the year, making a total of  $263\frac{1}{2}$  miles. The work is divided up among the different systems as follows:



Healey Falls tie line, 44,000-volt construction at corners



Central Ontario System, 44,000 v. Angle pole near Kingston substation No. 9368.

## SUMMARY OF WORK COMPLETED AND UNDER CONSTRUCTION

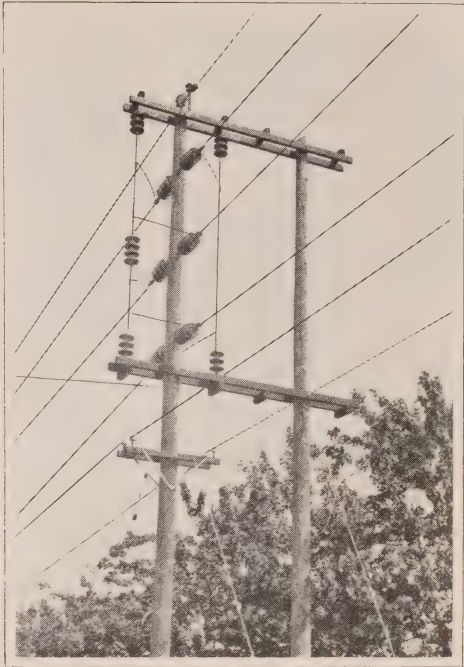
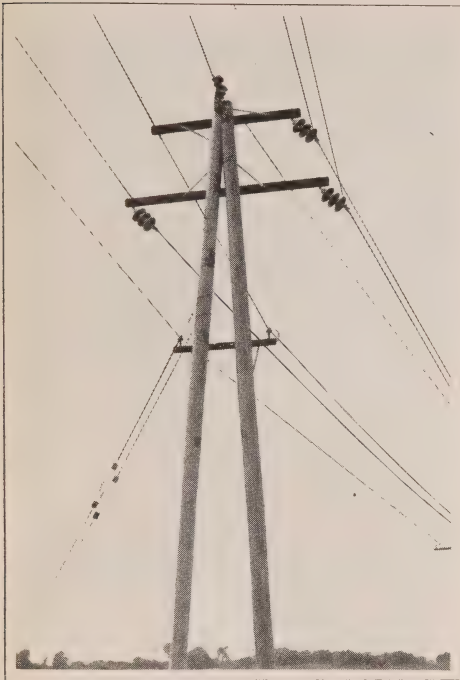
October 31, 1917, to October 31, 1918

Lines completed and under construction:

Voltage	Completed	Under Construction	Total
44,000.....	79.55	57.52	137.07
26,400.....	16.50	38.25	54.75
22,000.....	50.38	.....	50.38
13,200.....	3.11	.....	3.11
6,000.....	.....	.....	.....
4,000.....	15.69	2.50	18.19
	<hr/> 165.23 miles	<hr/> 98.27 miles	<hr/> 263.50 miles

Miles of transmission lines completed and under construction for the various systems:





Kingston Line, 44,000 v. Special A frame at small angle. No. 9369.

Kingston Line, 44,000 v. Transposition Pole. No. 9362.

Niagara System .....	37.62
St. Lawrence System .....	29.25
Severn System .....	50.20
Wasdells System .....	.....
Eugenia System .....	6.38
Muskoka System .....	.....
Central Ontario System .....	85.30
Rideau System .....	54.75
	<hr/>
	263.50 miles
Span Miles Single Circuit .....	263.32
Double Circuit .....	.18
3 Circuits .....	.....
4 Circuits .....	.....
	<hr/>
	263.50 miles
Power—	
Aluminum .....	90.24
Copper .....	78.33
Steel .....	94.93
	<hr/>
	263.50 miles

Ground Cable—	
Steel .....	245.31
Iron .....	18.19
	<hr/>
	263.50 miles
Telephone—	
Copper Clad Steel .....	30.53
Galvanized Iron .....	214.78
	<hr/>
	245.33 miles
Aluminum—	
3/0 .....	79.83
1¾/0 Steel Reinforced .....	191.43
	<hr/>
	271.26 wire miles
Copper—	
2/0 .....	91.59
1/0 .....	79.50
No. 4 .....	41.22
No. 6 .....	22.68
	<hr/>
	234.99 wire miles
Steel Cable (Power) .....	284.79 wire miles
Ground Cable .....	245.31
No. 6 B.W.G. Iron Wire .....	18.19
	<hr/>
	263.50 wire miles
Telephone Iron Wire .....	429.56
Copper Clad Steel .....	61.06
	<hr/>
	490.62 wire miles

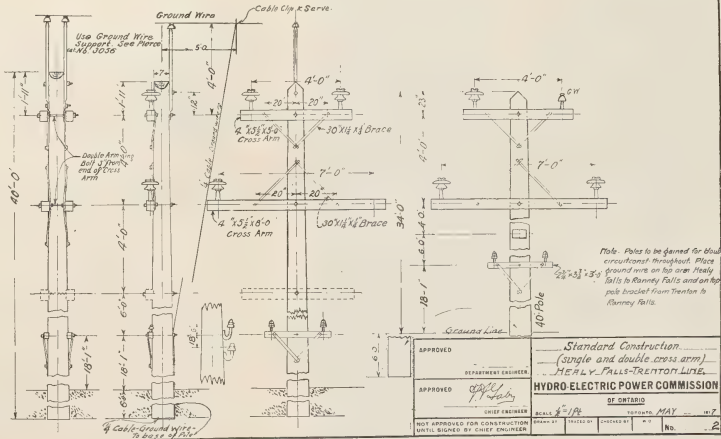
## SUMMARY

Conductor—Aluminum .....	271.26 wire miles
Copper .....	234.99 “
Steel .....	284.79 “
Ground Cable .....	245.31 “
No. 6 B.W.G. Iron .....	18.19 “
Telephone Iron Wire .....	429.56 “
Copper Clad Steel .....	61.06 “
Total Mileage Wood Pole Lines—	
Completed .....	165.23
Under construction .....	98.27
	<hr/>
	263.50 miles

Average Spans for Poles, 120 ft., 125 ft., 132 ft., and 175 ft.

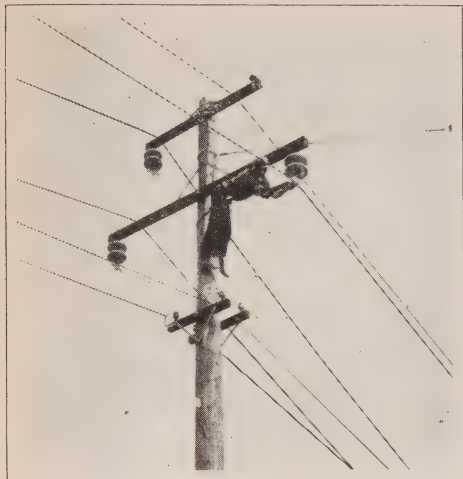
The term low tension lines in preceding annual reports has generally applied to voltages 13,200 and 26,400. In some cases the 26,400 volt lines have been “Y” connected so as to give operating voltages up to 45,000 volts. In this report the extensions to the 44,000 volt lines of the Central Ontario System have been grouped with low tension lines since they have been designed and constructed by elaborating the structures, organization and plant, used in building lines up to 26,400 volts.

Use Ground Wire Insulator for 6600 Volts  $1\frac{1}{8}$ " pin hole

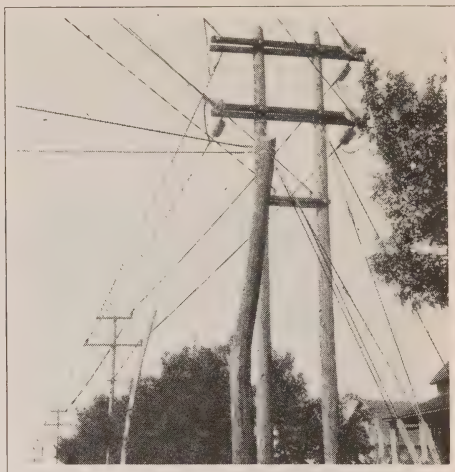








St. Lawrence System, 44,000 v. Cornwall Lines.  
Clamping in first conductor at small angle.  
No. 10,948.



St. Lawrence System, Cornwall Lines, 44,000 v.  
Construction at angle. No. 10944.

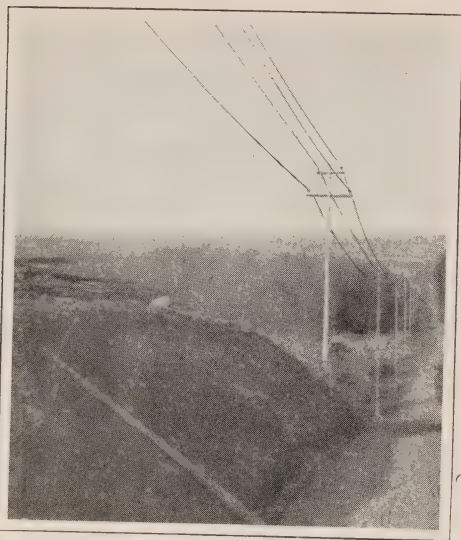
It was difficult last year to carry on construction work of any sort, and particularly line work, as men who are attracted to such work and have experience are usually classed as "A" men by the military authorities and sought by them. The result was that most of the experienced men left the service. Apart from the training of new men, there was the difficulty of securing men of any sort. Many of our construction crews were undermanned throughout the season, and eleven gangs were kept in the field most of the year.

### Type of Construction

The framing details shown in the Fifth Annual Report for 2,200, 13,200 and 22,000-volt lines have been generally followed. The pin spacing for practically all low tension line construction is 3 feet or more, and pole spacing is generally 132 feet or greater. Some lines have been built using 120 feet pole spacing.

The practice of double-arming at corners and placing two pins and insulators to support the wire at the corners has been found unsatisfactory, particularly for the larger conductors under Ontario weather conditions. The result is that strain insulators are generally used on these corners.

On account of the difficulty of securing certain materials several different types of construction have been used on sections of 44,000-volt lines which were constructed during the year. Sketch C. O. L. 50-1 shows the type of construction used on the line between Napanee and Kingston. This line now carries one circuit of 1/0 copper, with telephone and sky wire. Provision is made for second circuit at 44,000 volts. The line runs generally along the highways and has 4 foot conductor spacing and 6 feet 10 inches between circuits. For the first circuit the conductors are generally strung one at each end of the middle arm and the third at one end of the upper arm, the braces being arranged so as to operate in tension for this arm. The sky wire is insulated from the pole and is grounded every fifth pole by carrying a tap from the sky wire at about 4 feet from the pole aerially to the pole service near the telephone arm, thence to the base of the pole, being stapled every 24 inches. This practice increases materially the insulation but adds some hazard to the line



Central Ontario System, 44,000 v. Healey Falls Line. Standard Construction. No. 10373.

the Dominion Government feeder canal used suspension insulators throughout and was erected with least expense. Standard construction is shown in photograph No. 10948, where the conductor is being clamped in. Angles for this single circuit are taken on poles as shown in photograph No. 10944. Two other sections which will ultimately operate at this voltage are in the course of construction, one being Cornwall to Morrisburg, and the other to connect the town of Picton with the existing lines of the Central Ontario System. The conductors on these lines are supported by pin type insulators, except at anchors and angles, where the load from the conductor is carried to the pole, first, through strain insulators, and then through the double arm, as shown in photograph No. 10944. The poles for these lines are generally 40 feet or longer, the conductor spacing is generally not less than 4 feet and the standard pole spacing is 176 feet.

### Right-of-Way

A very large percentage of the low tension lines constructed to date have been built along highways. As these lines usually connect up urban centres, it is often found that the highway having the shortest distance is very much congested with telephone and telegraph lines. If one side of such a highway has been left vacant, it is usually seriously obstructed by valuable shade trees. On this account in a number of cases, the lines are longer than necessary and pass along roads which are very difficult to travel, ac-

as compared with grounded pins, since a defective insulator might account for the dropping of a phase by burning off an arm. Photographs No. 5.9366 and 10972 show standard construction for this line, while No. 5.9368, 9228, 9369 and 9362 show special conditions, the latter being a transposition with provision for second circuit.

Drawing No. C. O. S. 1723-E-1/B shows standard pole for a tie line between Healey Falls and Trenton stations, which are located on the Trent River. Photograph No. 10373 indicates standard construction and No. 10852 shows conditions at angles. This line carries 2/0 copper, and operates at 44,000 volts.

A line built from Welland to Dunnville along the right-of-way of



Kingston Line, 44,000 v. Standard construction with provision for second circuit. No. 9366.





	Description					
	NIAGARA					
Sec. No.	From	To	Length of Pole	Span	Miles	No. of Poles
L.T.			feet	feet		
1	Dundas Sub. H.E.P.C....	Junction Pole No. 134....	40	120	2.84	134
2	Junction Pole No. 134....	Beach Pump House.....	40	120	6.34	323
3	" " No. 134....	Asylum .....	50	120	1.13	67
4	Kitchener Sub. H.E.P.C..	Junction Pole No. 10 ....	40	120	.18	10
5	Junction Pole No. 10....	Waterloo .....	40	120	1.64	78
6	" " No. 10....	Kitchener Corp. Station .	45	120	.76	35
7	Kitchener Sub. H.E.P.C..	New Hamburg.....	40	120	12.27	556
7a	Junction Pole 405.....	Baden.....	40	120	1.13	7
8	Woodstock Sub. H.E.P.C.	Ingersoll .....	40	120	9.90	455
9	" "	Junction Pole No. 508....	40	120	11.12	508
10	Junct. Pole No. 508 L.T. 9	Tillsonburg.....	40	120	10.30	467
11	" " No. 508 "	Norwich.....	40	120	4.59	207
12	St. Thomas Sub. H.E.P.C.	St. Thomas Corp. Station	40& 45	120	1.13	50
13	Stratford " "	Stratford " "	40& 45	120	1.75	78
14	Preston " "	Junction Pole No. 99....	45	120	2.04	99
15	Junction Pole No. 99....	Hespeler.....	40	120	2.08	99
16	" " No. 99....	Galt.....	40	120	3.75	173
17	Preston Sub. H.E.P.C....	Preston Corp. Station....	35	120	.14	11
			These poles also carry Section L.T. 35			
18	London Sub. ....	Junction Pole No. 38....	40	120	.79	38
19	Junction Pole No. 38....	Asylum, London .....	45	120	1.54	70
20	" " No. 38....	Junction Pole No. 93....	40	120	1.22	55
21	London Sub. H.E.P.C....	London Sub. No. 1.....	40	120	3.56	178
22	Junction Pole No. 93....	" " No. 1 .....	40	120	1.71	96
23	" " No. 93....	" " No. 2 .....	40	120	.31	20
24	London Sub. No. 1.....	Springbank .....	40	120	3.55	156
26	Cooksville Sub. H.E.P.C.	Port Credit L.S. Road ...	40	120	2.74	129
26a	Pt. Credit L.S. Road....	Port Credit Brick Works	45	120	.24	14
27	Cooksville Sub. H.E.P.C.	Brampton .....	40	120	11.24	510
			These poles also carry Section L.T. 34 Circuits			
28	Junc. Pole No. 1550 L.T. 149	Clinton.....	40	120	1.27	62
29	" " No. 1153 " 148	Seaforth.....	40	120	1.50	74
30	" " No. 648 " 149	Mitchell .....	40	120	1.27	63
31	Guelph Sub. H.E.P.C....	O. A. College.....	40	120	1.56	78
32	" H.E.P.C. Sub. Pro- perty.....	} .....	40	120	.09	7 }
			18 poles on Station			
34	Cooksville Sub. H.E.P.C..	Weston.....	40	120	14.07	551
			These Circuits carried on			
35	Preston Sub. H.E.P.C....	G. P. & H. Ry. ....	40	120	.12	6
			These Circuits carried on			
36	Junction Pole No. 84, Port Credit .....	} Mimico (New Toronto).	45	120	5.75	266
38	Dundas Sub. H.E.P.C....	Dom. Sewer Pipe Works.	40	120	7.35	350
39	Hamilton Asylum P.H...	Hamilton Asylum.....	35	120	.63	30
40	Junction Pole No. 260....	Waterdown .....	35	120	1.50	72
40a	Dom. Sewer Pipe Works.	Junction Pole No. 260....			1.92	
41	St. Thomas Sub. H.E.P.C.	Port Stanley.....	35	120	12.27	573
42	Junction Pole, No. 289, LT. 8	Standard White Lime Co.			1.00	2
43	Dundas Sub. H.E.P.C....	Jno. Bertram & Son....	40	120	1.21	69
44	Baden Sub. ....	Wellesley .....	30	150	7.92	316
45	Jct. Pole No. 290 L.T. 106	Beachville .....	40	50	.01	1
46	St. Mary's Sub. ....	St. Mary's Cement Works	40	120	2.22	80
47	Dundas Sub. ....	Caledonia.....	40	120	14.36	674
47a	Caledonia .....	Paris Alabastine Co....			.22	
			These Circuits carried on			







Lines—Continued

SYSTEM

Voltage	No. of Circuits	Power Cables B. & S. Gauge	Telephone Wires, B. & S. & B. W. G. Gauge	Ground Wire.	Work Commenced	Work Completed	In Operation
13,200	1	3/0 Alum	8 C.C.Steel	1/4" Gal. Steel	June 22, 1912	Sept. 18, 1912	Sept. 20, 1912
"	1	2 "	10 "	1/4" "	Feb. 28, 1913	May 2, 1913	Aug. 15, 1913
"	1	3/0 "	8 "	1/4" "	June 15, 1912	Sept. 18, 1912	Sept. 20 "
"	1	2 "	8 "	1/4" "	Aug. 9, "	Oct. 11, "	Oct. 27, 1912
2,200	1	6 D.B.W.P.	Copper		June 10, "	Aug. 3, "	Aug. 6 "
L.T. 36 poles							
2,200	1	6 "			Nov. 22, "	Jan. 3, 1913	Dec. 24 "
13,200	1	2 Alum	8 CC.Steel	1/4" Gal. Steel	Aug. 19, "	Dec. 14, 1912	Dec. 14 "
"	1	2 "	10 "	1/4" "	May 14, 1913	May 19, 1913	Sept. 4, 1913
"	1	2 "	8 "	1/4" "	Aug. 19, 1912	Dec. 14, 1912	Dec. 14, 1912
"	1	2 "	8 "	1/4" "	" 19, 1912	Dec. 14, 1912	Dec. 14 "
2,200	1	1/0 "			Oct. 16, 1912	Nov. 21, "	Nov. 17 "
"	1	4 D.B.W.P.	Copper		Nov. 20, 1912	Nov. 30, "	Nov. 30 "
Section L.T. 47 poles.							
13,200	1	3/0 Alum	10	1/4" Gal. Steel	Nov. 25, 1912	Mar. 13, 1913	Mar. 13, 1913
6,600	1	2 "			Dec. 2, 1912	Apl. 11, "	Apl. 1 "
L.T. 17 poles, No. 1 to 11, inclusive. L.T. 35 from 11 to 17 inclusive.							
2,200	1	2 Copper			Mar. 30, 1912	Feb. 3, "	Apl. 26 "
L.T., 36 poles							
13,200	1	3/0 Alum	10 C.C.Steel	1/4" Gal. Steel	Mar. 11, 1913	Aug. 1, "	Aug. 1 "
"	1	2 "	10 "	1/4" "	May 6, 1913	July 3, "	Aug. 1 "
26,400	2	3/0 "	10 "	1/4" "	Nov. 11, 1913	Jan. 2, 1914	Jan. 3, 1914
26,400	2	3/0 "	10 "	1/4" "	Dec. 15, 1913	Jan. 17, "	Jan. 17 "
26,400	1	3/0 "					
13,200	1	2 "	10 C.C.Steel	1/4" Gal. Steel	May 17, 1913	Oct. 14, 1913	Oct. 25, 1913
6,600	1	2 "	10 "	1/4" "	Apr. 4, 1913	Dec. 23, 1913	Dec. 23, 1913
46,000	4	4/0 Copper	8 "	1/4" "	Mar. 15, 1914	Steel Towers.	Aug. 20, 1914
46,000	4	4/0 "	8 "	1/4" "	Mar. 15, 1914		Aug. 20, 1914
46,000	1	2/0 "	8 "	1/4" "	July 11, 1914		Oct. 17, 1914
13,200	1	2 Alum		1/4" "	Sept. 18, 1913	May 8, 1914	Jan. 27, 1914
"	1	2 "		1/4" "	Oct. 10, 1913	Feb. 6, 1914	Feb. 6 "
"	1	2 "		1/4" "	Oct. 13, 1913	Jan. 19, "	Jan. 27 "
"	1	2 "	10 C.C.Steel	1/4" "	Nov. 1, 1913	Nov. 24, 1913	Nov. 24, 1913
26,400	4	3/0 "	10 "	1/4" "	July 28, 1914	Sept. 6, 1914	Sept. 6, 1914
"	2	3/0 "	10 "	1/4" "	July 31, 1914	Sept. 18, 1914	Sept. 18 "
"	2	3/0 "	10 "	1/4" "	June 2, 1914	Aug. 1, 1914	Sept. 6 "
"	2	2/0 "	10 "	1/4" "	Oct. 21, 1914	Feb. 22, 1915	Feb. 1, 1915
13,200	1	3/0 "	10 "	1/4" "	June 3, 1914	Oct. 17, 1914	Oct. 22, 1914
"	1	3/0 "	10 "	1/4" "	Aug. 18, 1914	Oct. 28, 1914	Oct. 22 "
"	1	3/0 "	10 "	1/4" "	Aug. 1, 1914	Oct. 13, 1914	Oct. 22 "
26,400	1	1/0 "	10 "	1/4" "	July 21, 1914	Nov. 30, 1914	Dec. 1 "
26,400	1	6 B.W.G.	9 B.W.G.	1/4" "			
"	1	1/0 Alum	10 C.C.Steel	1/4" "	Sept. 15, 1914	Nov. 30, 1914	Dec. 1 "
"	1	1/0 "	10 "	1/4" "	July 13, 1914	Nov. 30, 1914	Dec. 1 "
4,000	1	6 Copper		1/4" "	Aug. 17, 1914	Nov. 30, 1914	Dec. 18 "
"	1	4 "		1/4" "	Aug. 17, 1914	Nov. 30, 1914	Dec. 1 "
on L.T. 90 Poles							
4,000	1	6 "		1/4" "	Mar. 19, 1914	Mar. 19, 1915	Mar. 19, 1915
13,200	1	1/0 Alum	10 C.C.Steel	1/4" "	June 10, 1914	June 30, 1914	July 3, 1914
"	1	3/0 "	10 "	1/4" "	Sept. 1, 1914	Nov. 30, 1914	Nov. 30 "
"	1	3/0 "	10 "	1/4" "	Oct. 15, 1914	Nov. 30, 1914	Nov. 30 "
"	1	3/0 "	10 "	1/4" "	Sept. 29, 1914	Nov. 30, 1914	Nov. 30 "
"	1	3/0 "	10 "	1/4" "	Sept. 14, 1914	Nov. 30, 1914	Nov. 30 "
"	1	2 S.R.	10 BWG Iron	1/4" "	Oct. 23, 1914	Jan. 20, 1915	Jan. 21, 1915
"	1	2 S.R.			July 3, 1916	Dec. 7, 1916	Dec. 7 1916
on L.T. 18 poles 1 to 38, L.T. 19 poles 38 to 100 and L.T. 99.							
12,000	2	4/0 Copper	9 BWG Iron	1/4" Gal. Steel	Oct. 27, 1915	Oct. 31, 1915	Oct. 31 1915
26,400	1	2 S.R. Alum	10 C.C.Steel	1/4" Gal. Steel	Jan. 13, "	May 12, "	Mar. 3, "
on H.T. Telephone Poles							



## Description of

## NIAGARA

Sec. No.	From	To	Length of Pole.	Span.	Miles	No. of Poles
			feet	feet		
102	Kent Station.....	Junction No. 68 .....	40	120	1.48	68
102a	" .....	Junction No. 68 .....			1.48	
102b	" .....	Junction Pole No. 68 .....			1.48	
103	Junction Pole 68, L.T. 102	Junc. Pole No. 520 L.T. 103	40	120	9.98	451
103a	" " 68 L.T. 102	Junc. Pole No. 520 L.T. 103			9.98	
104	" " 520 L.T. 103	Wallaceburg .....	40	120	8.50	386
105	" " 520 L.T. 103	Dresden .....	40	120	7.40	309
106	" " 289 L.T. 8	Embrow .....	35	132	6.10	254
106a	Junction Pole 289 L.T. 8..	Beachville .....				1
107	" " 564 L.T. 34	Woodbridge .....	35	132	6.44	277
108	Woodbridge .....	Bolton .....	35-40	132	13.03	540
109	Junction Pole .....	W. T. & I.Ry. ....			.02	2
110	Mimico Sub-Station ....	Prison Brick Yard .....	30	125	.71	32
111	Brant Sub-Station .....	Junction Pole 253 .....	35-40	132	5.84	249
112	Junction Pole 253 L.T. 111	Burford .....	35	132	3.48	142
113	" " 253 L.T. 111	Waterford .....	35-40	132	14.20	616
113a	Junction Pole 869 L.T. 113	Waterford .....	40	135	.09	5
114	Waterford .....	Simcoe .....	35	132	8.90	366
114a	Junc. Pole 1230 L.T. 114..	L. E. & N. Ry. ....	45	120	.25	11
115	Tilbury .....	Comber .....	30	132	7.26	306
116	Delaware Sub-Station ...	Lambeth .....	40	120	6.58	
					Carried on	
117	" " Junc. Pole 760..	Mount Brydges .....	40	120	4.60	
					Carried on	
118	Bertram's Sub-Station, Pole No. 69 L.T. 43....	Dundas .....	55	120	.37	21
119	Junction Pole 760 L.T. 96	Delaware Sub-Station ...	55	120	.09	5
					Lambeth & Mt. Brydges	
121	St. Thomas .....	Dutton .....	30	132	18.50	756
122	Ridgetown .....	Highgate .....			6.18	9
					These circuits carried on	
123	Junction Pole 68 L.T. 102	Thamesville .....	35	132	14.60	683
124	Junction Pole 676 L.T. 123	Bothwell .....	35	132	9.83	410
125	Stratford .....	Tavistock .....	35	132	9.72	398
126	Junction Pole 69 L.T. 102	Blenheim .....	35	132	9.52	390
127	Junction Pole 469 L.T. 123	Ridgetown .....	35	132	8.02	533
128	Brant .....	St. George .....	30	132	9.09	369
					4.50 miles carried	
129	Dundas Junction Pole 82 ..	Lynden .....	35	132	10.34	430
130	Lucan .....	Ailsa Craig .....	30	132	10.14	410
131	Dresden .....	Petrolia .....	35-40	125	21.78	947
132	Petrolia .....	Wyoming Jct. Pole 1962 L.T. 132	40	125	4.85	220
133	Wyoming Jct. Pole 1962 ..	Perch Jc. Pole 2304 " 133	35	125	7.92	343
134	Lucan .....	Granton .....	30	132	6.95	246
135	Perch Jct. Pole 2304 L.T. 133	Sarnia .....	35	125	7.73	332
136	Lucan .....	Exeter .....	35	132	13.24	552
137	Petrolia .....	Wyoming .....	25	132	7.50	25
138	Sebringville Junction Pole 311 L.T. 146 .....	Milverton Jct. Pole 802 L.T. 138	35	132	11.90	491
139	Milverton Jct. Pole 802 L.T. 138	Milverton .....	35	132	.96	40
140	" " 802 " 138	Listowel Jct. Pole 1314 L.T. 140	35	132	12.65	512
141	Listowel Jc. Pole 1314 " 140	Listowel .....	35	132	2.77	122
142	" " 1314 " 140	Palmerston .....	35	132	10.48	431
143	Palmerston .....	Harriston .....	35	132	6.11	259
145	Wyoming Jct. Pole 1963 L.T. 312	Forest .....	35-40	132	20.10	817
146	Stratford Sub .....	Junct. Pole 311 L.T. 146..	40	120	6.81	311
147	Junct. Pole 311 L.T. 146..	Junct. Pole 648 L.T. 147..	40	120	7.61	337



## Lines—Continued

## SYSTEM

Voltage.	No. of Cir- cuits	PowerCables B. & S. Gauge	Telephone Wires, B. & S. & B.W.G. Gauge	Ground Wire	Work Commenced	Work Completed	In Operation
26,400	1	1/0 "	10 BWG Iron	1/4" Gal.Steel	Oct. 28, 1914	Feb. 3, 1915	Feb. 3, 1915
"	1	3/0 "	"	"	June 22, 1915	June 29, "	June 29 "
"	1	3/0 "	"	"	Oct. 7, "	Oct. 13, "	Oct. 13 "
"	1	1/0 "	10 BWG Iron	1/4" Gal. Steel	Oct. 30, 1914	Feb. 3, "	Feb. 3 "
"	2	3/0 "	"	"	Oct. 12, 1915	Mar. 15, 1916	Mar. 15, 1916
"	1	1/0 "	10 BWG Iron	1/4" Gal. Steel	Nov. 6, 1914	Feb. 3, 1915	Feb. 3 1915
"	2	3/0 "	10 "	1/4" "	Nov. 3, "	May 1, "	Mar. 30 "
13,200	1	1/4 Steel	10 "	1/4" "	Oct. 1, "	Dec. 24, 1914	Dec. 22, 1914
13,200	1	1/0 Alum	"	1/4" "	"	"	"
"	1	1/0 "	10 "	1/4" "	Sept. 25, "	Oct. 21, "	Dec. 2 "
"	1	1/0 "	10 "	1/4" "	Oct. 20, "	Nov. 26, "	Jan. 26, 1915
"	1	2 "	10 "	1/4" "	Sep. 12, "	Sep. 12, "	Sep. 13, 1914
2,200	1	2/0 Copper	"	"	Oct. 24, "	Feb. 17, 1915	Feb. 17, 1915
26,400	1	2 S.R. Alum	10 BWG Iron	1/4" Gal. Steel	Nov. 6, "	May 4, "	May 6 "
"	1	2 S.R. "	10 "	1/4" "	Nov. 21, "	May 28, "	May 6 "
"	1	2 S.R. "	10 "	1/4" "	Nov. 21, "	May 5, "	May 10 "
"	1	2 S.R. "	10 "	1/4" "	"	"	"
"	1	2 S.R. "	10 "	1/4" "	Nov. 26, "	May 7, "	May 9 "
"	1	2 S.R. "	9 "	1/4" "	"	"	"
4,000	1	5/16 Steel	"	1/4" "	Jan. 14, 1915	May 8, "	Apr. 20 "
"	1	6 Copper	"	1/4" "	Jan. 25, "	Mar. 12, "	Mar. 15 "
L.T. 96 poles							
4,000	1	6 M.H.D.	"	1/4" "	Jan. 7, "	Jan. 23, "	Mar. 1 "
L.T. 97 poles		Copper					
13,200	2	2 Copper	10 BWG Iron	1/4" "	Feb. 25, "	Mar. 15, "	Mar. 15 "
"	1	3/0 Alum	10 "	1/4" "	Jan. 27, "	Mar. 9, "	Feb. 1 "
4,000 v. circuit carried on L.T.			119 poles				
13,200	1	1/0 Alum	"	1/4" "	May 3, "	Aug. 21, "	Aug. 27 "
4,000	1	6 Copper	"	6 B.W.G. Iron	Oct. 3, 1916	Nov. 4, 1916	Nov. 6, 1916
H.T. relay poles.							
26,400	1	1/0 Alum	9 BWG. Iron	1/4" Gal. Steel	May 18, 1915	July 14, 1915	Sep. 14, 1915
"	1	2 S.R. "	9 "	1/4" "	June 26, "	Aug. 17, "	Aug. 17 "
"	1	6 B.W.G. Iron	9 "	6 B.W.G. Iron	Sep. 9, "	Sep. 5, 1916	Oct. 26, 1916
"	1	2 S. R. Alum	9 "	1/4" Gal. Steel	July 2, "	Oct. 7, 1915	Oct. 20, 1915
"	1	2 "	9 "	1/4" "	June 24, "	Sep. 7, "	Nov. 24 "
4,000	1	2 "	9 "	1/4" "	July 1, "	Aug. 17, "	Aug. 17 "
on H.T. Tel. and Relay line							
13,200	1	2 S.R. Alum	9 BWG. Iron	1/4" "	July 24, "	Oct. 15, "	Oct. 22 "
4,000	1	2 S.R. "	"	1/4" "	July 28, "	Dec. 11, "	Dec. 15 "
26,400	2	3/0 "	9 BWG Iron	1/4" "	Aug. 30, "	Feb. 18, 1916	Apr. 6, 1916
"	2	3/0 "	9 "	1/4" "	Mar. 1, 1916	Sep. 12, "	Nov. 10 "
"	2	3/0 "	9 "	1/4" "	Apr. 6, "	Sep. 29, "	Nov. 10 "
4,000	1	6 Copper	"	6 B.W.G. Iron	Apr. 6, "	May 27, "	June 29 "
26,400	2	3/0 Alum	9 B.W.G. Iron	1/4" Gal. Steel	May 9, "	Nov. 4, "	Nov. 10 "
13,200	1	3/0 "	9 "	1/4" "	Nov. 26, 1915	May 4, "	May 4 "
4,000	1	6 Copper	9 "	"	Sept. 1, "	Oct. 4, "	Oct. 4 "
26,400	1	1/0 S.R. Alum	9 BWG. Iron	1/4" Gal. Steel	Sept. 20, "	May 15, "	May 18 "
"	1	2 "	9 "	1/4" "	Oct. 15, "	May 18, "	May 18 "
"	1	1/0 "	9 "	1/4" "	Oct. 13, "	May 22, "	May 27 "
"	1	2 "	9 "	1/4" "	Oct. 28, "	May 22, "	May 27 "
"	1	1/0 "	9 "	1/4" "	Oct. 14 "	June 6, "	June 6 "
"	1	1/0 "	9 "	1/4" "	Dec. 10, "	June 30, "	June 30 "
"	1	6 B.W.G. Iron	9 "	1/4" "	June 26, "	Dec. 4, "	Feb. 7, 1917
"	2	3/0 Alum	10 C.C. Steel	1/4" "	Apr. 23, 1913	June 4, 1914	Dec. 23, 1914
"	2	3/0 "	10 "	1/4" "	Apr. 23, "	June 4, "	Dec. 23 "

## Description of

## NIAGARA

Sec. No.	From	To	Length of Pole	Span	Miles	No. of Poles
			feet	feet		
148	Junct. Pole 648 L.T. 147..	Junct. Pole 1152 L.T. 148.	40	120	11.36	505
149	Junct. Pole 1153 L.T. 148.	Junct. Pole 1150 L.T. 149.	40	120	8.84	395
150	Junct. Pole 1150 L.T. 149.	Goderich .....	40	120	13.61	612
151	Exeter .....	Hensall .....	30	132	6.19	259
152	Niagara Falls Sub .....	Ont. Power Co. Line.....	40	125	.31	17
153	Dutton .....	West Lorne Sub-Station..	30	132	7.62	31
				This circuit carried		
154	West Lorne Sub-Station .	Rodney.....	30	132	4.00	161
				This circuit carried		
155	Etobicoke Sub-Station...	New Toronto Sub-Station	45	125	2.78	126
157	Wanstead Jct. Pole 2336 L.T. 145 .....	Watford .....	35	132	10.82	442
158	Junction Pole 873 L.T. 148	Dublin.....	30	150	1.26	47
159	Exeter Sub-Station.....	Sarepta Jct. 319.....	30	132	7.58	319
				This circuit carried		
160	Sarepta Jct. 319.....	Dashwood .....	30	132	1.35	55
161	Sarepta Jct. 319.....	Zurich.....	30	132	5.15	211
163	Cooksville Sub-Station...	Ont. Nat. Brick Co.....	55	120	1.78	89
				This circuit carried		
164	Welland .....	Dunnville.....	35	176	22.32	672
165	Essex Sub-Station .....	Sandwich Salt Co. ....	40	132	8.10	351
172	Jct. Pole 1445 L.T. 131...	Oil Springs .....	35	132	1.42	65
173	Jct. Pole 1445 L.T. 131...	Brigden.....	35	132	8.88	364
174	St. Thomas Sub-Station, Jct. Pole 107 L.T. 141..	Aylmer.....	35	132	9.60	406
178	Palmerston.....	Drayton .....	30	150	10.63	391
179	Erindale Power House...	Cooksville Sub-Station...	35	132	3.11	128
180	Jct. Pole 263 L. T. 178..	Moorefield.....	30	150	1.36	52
181	Toronto Milling Co.....	Primary .....			1.25	.....
				This circuit on		
182	Toronto Milling Co.....	Secondary .....				.....
183	T. N. Power Co. Sub-Sta.	C. P. Co. Sub.....				.....
184	Plattsville Jct. 712.....	Wolverton Mills .....			2.16	2
				This circuit ca		

## SEVERN

S.L.	From	To	Length of Pole	Span	Miles	No. of Poles
1	Waubashene.....	Jct. Pole 193 (Coldwater).	40	120	4.29	193
2	Jct. Pole 193 (Coldwater).	Coldwater .....	40	120	1.16	55
3	" " 193 " "	Jct. Pole 903 (Elmvale)..	40	120	15.86	710
4	" " 903 (Elmvale) ..	Elmvale .....	40	120	.42	19
5	" " 903 " "	Jct. Pole 1110 (Phelpston)	40	120	4.55	207
6	" " 1116 (Phelpston).	Barrie.....	40	120	12.27	550
7	" " 1110 " "	Jct. Pole 1785 (Stayner) ..	40	120	15.07	675
8	" " 1785 (Stayner)...	Stayner .....	40	120	1.50	68
9	" " 1785 " "	Collingwood.....	40	120	11.86	530
10	Stayner .....	Creemore .....	35	120	7.67	348
11	Big Chute .....	Waubashene.....	30	120	12.00	{ 504 } 496
12	Waubashene.....	Victoria Harbor Jct. 730.	35	100	3.59	190
13	Junction Pole 730 .....	Victoria Harbour.....	40	120	1.50	74
14	Victoria Harbor Jct. 730 .	Port McNicholl Jct. 969..	35	100	4.02	213
15	Port McNicholl Jct. 969 .	Port McNicholl .....	35	120	.50	35
16	Jct. Pole 969 Pt. McNicholl.	Midland .....	40	100	3.62	190
17	Midland .....	Penetang .....	40	120	4.69	223
20	Port McNicholl Jct. 940 .	C.P.R. Elevators.....	35	125	1.34	58
21	Jct. Pole 1590 S.L 6 .....	Camp Borden.....	35	132	14.34	604
24	Barrie Sub-Station.....	Jct. Pole 1(Painswick Tap)	40	125	3.88	183

## Lines.—Continued

## SYSTEM.

Voltage	No. of Cir- cuits	Power Cables B. & S. Gauge	Telephone Wires, B. & S. & B. W. G. Gauge	Ground Wire	Work Commenced	Work Completed	In Operation
26,400	2	3/0 "	10 C.C. Steel	1/4" Gal. Steel	Apl. 23, 1913	June 4, 1914	Dec. 23, 1914
"	2	3/0 "	10 "	1/4" "	Apl. 23, "	June 4, "	Dec. 23, "
"	2	3/0 "	10 "	1/4" "	Apl. 23, "	June 4, "	Dec. 23, "
4,000	1	6 Copper	.....	6 B.W.G. Iron	Sept. 11, 1916	Dec. 21, 1916	Dec. 21, 1916
12,000	2	2/0 "	.....	.....	Oct. 24, "	Nov. 1, "	Nov. 5, "
13,200	1	6 BWG Iron	.....	.....	Dec. 4, "	Jan. 19, 1917	Dec. 22, "
on H.T. Telephone and Relay Poles.							
4,000	1	6 MHD Copper	.....	6 BWG Iron	Jan. 2, 1917	Jan. 17, "	Jan. 15, 1917
on H.T. Telephone and Relay Poles.							
.....	.....	.....	.....	1/4" Steel	Feb. 9, "	.....	.....
26,400	1	6 BWG Iron	9 BWG Iron	1/4" "	June 9, "	Aug. 5, 1917	Aug. 10, 1917
4,000	1	6 Bare Copper	.....	6 BWG Iron	June 18, "	July 7, "	.....
4,000	1	2 S.R. Alum	.....	1/4" Steel	Mar. 21, "	June 13, "	Aug. 23, 1917
on L.T. 151 Poles 1 to 54,							
4,000	1	6 MHD Bare Copper	.....	1/4" "	Mar. 29, "	June 14, "	Aug. 23, "
4,000	1	2 S.R. Alum	.....	1/4" "	Mar. 29, "	June 18, "	Aug. 23, "
13,200	1	2 S.R. "	10 C.C. Steel	1/4" "	Mar. 6, "	Apr. 22, "	Apr. 22 "
on L.T. 27 from Pole 1 to 30—55 miles.							
44,000	1	5/16 Steel	9 BWG Iron	1/4" "	Aug. 17, "	Mar. 31, 1918	May 21, 1918
26,400	2	1/0 B & S Cop.	9 "	1/4" "	July 10, "	Oct. 12, 1917	Nov. 9, 1917
26,400	1	6 BWG Iron	9 "	1/4" "	July 20, "	Sept. 22, "	Dec. 5, "
26,400	1	6 BWG Iron	9 "	1/4" "	Aug. 1, "	Sept. 22, "	Dec. 6, "
13,200	1	1/4" Steel	9 "	1/4" "	Aug. 27, "	Oct. 27, "	Feb. 11, 1918
4,000	1	4 B & S Bare Copper	.....	6 BWG Iron	Oct. 24, "	Jan. 16, 1918	Feb. 22, "
13,200	1	4 B & S "	9 BWG Iron	9/32" Steel	Oct. 27, "	Nov. 22, 1917	Dec. 14, 1917
4,000	1	6 Bare Copp	.....	6 BWG Iron	Dec. 1, 1917	Dec. 20, "	Feb. 22, 1918
4,000	1	6 Copper	.....	6 BWG Iron	Feb. 2, 1918	Mar. 1, 1918	Mar. 9, 1918
Streetsville Poles							
.....	.....	.....	.....	.....	Feb. 13, 1918	Mar. 10, 1918	Mar. 9, 1918
12,000	2	300,000 C.M	Copper	.....	.....	.....	.....
4,000	1	6 M.H.D. Cop	.....	.....	Sept. 18, 1918	Oct. 22, 1918	.....
rried on L. T. 90 poles from pole No. 712 to 636.							

## SYSTEM

22,000	2	4/0 Alum	10 C.C. Steel	1/4" Gal. Steel	Sep. 20, 1912	Feb. 18, 1913	Feb. 24, 1913
"	1	2 "	10 "	1/4" "	Sep. 20, "	Feb. 18, "	Feb. 24 "
"	2	4/0 "	10 "	1/4" "	Sep. 25, "	Feb. 18, "	Feb. 24 "
"	1	2 "	10 "	1/4" "	Feb. 1, 1913	May 17, "	May 27 "
"	2	4/0 "	10 "	1/4" "	Oct. 20, 1912	Feb. 18, "	Feb. 24 "
"	2	2/0 "	10 "	1/4" "	Nov. 6, "	Apl. 5, "	April 6 "
"	2	3/0 "	10 "	1/4" "	Oct. 23, "	Feb. 18, "	Feb. 24 "
"	1	2 "	10 "	1/4" "	Jan. 24, 1913	Apl. 26, "	Sep. 25 "
"	2	3/0 "	10 "	1/4" "	Nov. 1, 1912	Feb. 18, "	Feb. 24 "
4,000	1	1/0 "	.....	1/4" "	Aug. 15, 1914	Oct. 25, 1914	Oct. 21, 1914
22,000	2	{1-2/0 "	1-12 B.W.G. }	1/4" "	.....	.....	.....
"	1	{1-4/0 "	1-9 "	1/4" "	.....	.....	.....
22,000	2	1/0 "	10 C.C. Steel	1/4" "	Apl. 1, 1916	May 5, 1916	July 24, 1916
22,000	1	2/0 "	12 B.W.G.	1/4" "	.....	.....	.....
"	2	1/0 "	10 "	1/4" "	Mar. 7 "	May 5 "	July 24 "
22,000	1	1/0 "	10 "	1/4" "	Oct. 15, 1914	Dec. 25, 1914	Dec. 24, 1914
22,000	2	{1-2 Alum }	12 B.W.G.	.....	.....	.....	May 22, 1917
"	1	{1-1/0 SR "	.....	.....	.....	.....	.....
22,000	2	2 Copper	10 "	1/4" "	June 7, 1911	July 18, 1911	July 18, 1911
"	2	1/0 Alum	9 B.W.G. Iron	1/4" "	Feb. 29, 1916	Apl. 14, 1916	July 24, 1916
"	1	6 Copper	9 "	6 B.W.G. Iron	May 30 "	July 11, 1916	June 29 "
22,000	1	1 3/4/0 S R Alum	9 "	1/4" Steel	Sept. 13, 1917	Feb. 9, 1918	Apr. 25, 1918

## Description of

## SEVERN

Sec. No.	From	To	Length of Pole	Span	Miles	No. of Poles
S. L.			feet	feet		
25	Jct. 1 (Painswick Tap) ..	Jct. Pole 2 (Thornton Tap)	40	125	4.28	187
26	" 2 (Thornton " " ) ..	" " 3 .....	40	125	5.99	261
27	Jct. 3 .....	Jct. 4 (Cookstown Tap.) ..	40	125	2.24	98
28	Jct. 4 (Cookstown Tap.) ..	Jct. 5 (Alliston " " ) ..	40	125	7.35	321
29	Jct. 5 (Alliston " " ) ..	Alliston Sub-Station ....	40	125	1.82	87
30	Jct. 5 (Alliston " " ) ..	Jct. 6 (Beeton Tap.) ....	40	125	6.30	283
31	Jct. 6 (Beeton " " ) ..	Tottenham Sub-Station ..	40	125	3.61	176
32	Jct. 6 (Beeton " " ) ..	Beeton Sub-Station .....	40	125	1.76	85
33	Jct. 3 .....	Jct. 7 (Fennel Tap.) ....	40	125	3.87	169
34	Jct. 7 (Fennel Tap.) ....	Bradford Sub-Station ....	40	125	7.25	320
35	Jct. (Thornton " " ) ....	Thornton Sub-Station ...	40	125	1.85	81

## ST. LAWRENCE

STL						
1	Morrisburg .....	Prescott .....	40	120	22.96	1,083
2	" .....	Winchester .....	40	120	16.29	747
3	Winchester .....	Chesterville .....	40	120	6.52	294
5	Prescott .....	Brockville .....	40	120	14.08	639
6	Morrisburg .....	North Williamsburg .....			6.50	
This circuit carried on St. L. 2 poles						
8	Morrisburg .....	Cornwall .....	40	176	26.25	808
11	Erecting Steel Towers	at Cornwall Sub-Station			This circuit carried on	
12	Cornwall .....	Toronto Pap. Mill. ....	40	176	3.00	107

## WASDELL'S FALLS

W.L						
1	Waddell's Falls .....	Jct. No. 1 Pole 1203 ....	40	120	25.50	1,203
1a	" .....	Junction Pole 183 .....	40	120	3.94	
	Carried on W.L. 1 Pole					
2	Jct. No. 1 Pole 1203 .....	Beaverton .....	40	120	1.47	70
3	Jct. No. 1 " 1203 .....	Cannington .....	40	120	9.67	442
4	Beaverton .....	Gamebridge .....			6.50	
	Carried on Sec. W.L. 1 & 2 poles					
5	Gamebridge .....	Brechin .....			3.75	
	Carried on Sec. W.L. 1 poles					
6	Cannington .....	Woodville .....	30	120	5.15	147
7	Cannington .....	Sunderland .....	30	120	7.40	335
8	Jct. Pole 183 W.L. 1 ....	Longford .....	35	132	6.41	269

## EUGENIA FALLS

EFL						
1	Eugenia Falls Pwr. House	Chatsworth Sub-Station.	40	125	22.15	972
2	Chatsworth Sub-Station.	Owen Sound .....	40	125	9.22	394
3	Eugenia Falls .....	Flesherton .....	40	125	6.78	296
4	Flesherton Jct. Pole 297.	Durham Jct. Pole 964 ...	40	125	15.97	687
5	Durham Jct. Pole 964 ....	Mount Forest .....	40	125	15.70	692
6	Laurel Jct. ....	Grand Valley .....	35	132	8.50	357
7	Durham Jct. Pole 964 ....	Hanover Jct. Pole 1491 ..	40	125	12.09	526
8	Hanover Jct Pole 1491 ..	Chesley .....	40	125	11.06	473
9	Flesherton Jct. Pole 297.	Dundalk .....	40	125	11.73	500
10	Dundalk .....	Shelbourne .....	40	125	13.16	562



Lines.—Continued

SYSTEM

Voltage	No. of Cir- cuits	PowerCables B.&S. Gauge	Telephone Wires, B.&S. & B.W.G. Gauge	Ground Wire	Work Commenced	Work Completed	In Operation
22,000	1	1 $\frac{3}{4}$ /0 SRAlum	9 BWG Iron	$\frac{1}{4}$ " Steel...	Oct. 6, 1917	Feb. 19, 1918	Apr.25,1918
"	1	1 $\frac{3}{4}$ /0 " " "	9 "	$\frac{1}{4}$ " " " "	Oct. 20, "	Mar. 4, "	Apr.25, "
"	1	1 $\frac{3}{4}$ /0 " " "	9 "	$\frac{1}{4}$ " " " "	Nov. 8, 1917	Mar. 9, "	Apr.25, "
"	1	1 $\frac{3}{4}$ /0 " " "	9 "	$\frac{1}{4}$ " " " "	Nov. 16, 1917	Mar. 23, "	May 23, "
"	1	1 $\frac{3}{4}$ /0 " " "	9 "	9/32 " " "	Dec. 8, 1917	Apl. 17, "	May 23, "
"	1	5/16 " Steel	9 "	9/32 " " "	Jan. 2, 1918	May 14, "	July 26, "
"	1	5/16 " " "	9 "	9/32 " " "	Jan. 30, 1918	May 22, "	Sept. 9, "
"	1	5/16 " " "	9 "	9/32 " " "	Feb. 28, 1918	May 28, "	July 26, "
"	1	5/16 " " "	9 "	9/32 " " "	May 29, 1918	July 3, "	Sept.16, "
"	1	5/16 " " "	9 "	9/32 " " "	Mar.19,1918	July 3, "	Sept.16, "
"	1	5/16 " " "	9 "	9/32 " " "	June 15, 1918	July 1, "	Oct. 16, "

SYSTEM

26,400	1	3/0 Alum	10 C.C.Steel	$\frac{1}{4}$ " Gal. Steel	Oct. 29, 1912	June 14, 1913	Oct. 23, 1913
"	1	5/16 " "	10 " "	$\frac{1}{4}$ " " "	June 4, " "	Dec. 15, 1913	Dec. 18, " "
"	1	3/0 Alum	10 " "	$\frac{1}{4}$ " " "	Sept. 6, 1913	Feb. 17, 1914	Feb. 7, 1914
"	1	3/0 " "	10 " "	$\frac{1}{4}$ " " "	Oct. 16, 1914	Mar. 20, 1915	Apr. 4, 1915
2,200	1	6 Copper	.....	.....	Feb. 22, 1915	Mar. 20, " "	Mar.20, " "
44,000	1	3/0 Alum	9 BWG Iron	9/32" Steel	May 7, 1918	.....	.....
St. L 2 from Pole 1-94			1.96 miles				
.....	.....	.....	.....	.....	Sep. 25, 1918	.....	.....
44,000	1	7/16 Steel	9 BWG Iron	9/32" Steel	Sep. 24, 1918	.....	.....

SYSTEM

22,000	1	5/16 Steel	10 C.C.Steel	$\frac{1}{4}$ " Gal. Steel	Jan. 17, 1914	Sep. 28, 1914	Sep. 28, 1914
"	1	1/0 Alum	.....	.....	July 6, 1916	July 23, 1916	July 23, 1916
"	1	$\frac{1}{4}$ " Steel	10 C.C.Steel	$\frac{1}{4}$ " Gal. Steel	Mar. 30, 1914	Sep. 28, 1914	Sep. 28, 1914
"	1	$\frac{1}{4}$ " " "	10 " "	$\frac{1}{4}$ " " "	Feb. 18, " "	Sep. 28 " "	Sep 28 " "
4,000	1	1/0 Alum	.....	.....	May 2, " "	.....	Oct. 6 " "
4,000	1	1/0 " "	.....	.....	July 25, " "	.....	Oct. 6 " "
4,000	1	1/0 " "	.....	$\frac{1}{4}$ " Gal. Steel	May 19, " "	.....	Oct. 19 " "
4,000	1	1/0 " "	.....	$\frac{1}{4}$ " " "	June 1, " "	July 10, 1914	Oct. 19 " "
22,000	1	1/0 " "	9 B.W.G.Iron	$\frac{1}{4}$ " " "	Feb. 17, 1916	May 27, 1916	June 4, 1916

SYSTEM

22,000	2	3/0 Alum	9 B.W.G.Iron	$\frac{1}{4}$ " Gal .Steel	Mar. 17, 1915	July 7, 1915	Nov.18,1915
"	2	3/0 " "	9 " "	$\frac{1}{4}$ " " "	Apr. 7, " "	Sep. 24, " "	Nov. 18 " "
"	2	3/0 " "	9 " "	$\frac{1}{4}$ " " "	Apr. 10, " "	July 21, " "	Nov. 18 " "
"	2	3/0 " "	9 " "	$\frac{1}{4}$ " " "	Apr. 13, " "	July 11, " "	Nov. 18 " "
"	2 {	1-5/16 Steel	} 9 " "	$\frac{1}{4}$ " " "	Apr. 26, " "	Aug. 25, " "	Nov. 18 " "
"		1-3/0 Alum					
"	1	6 Copper	9 " "	$\frac{1}{4}$ " " "	July 21, 1916	Dec. 1, 1916	Dec. 1, 1916
"	1	3/0 Alum	9 " "	$\frac{1}{4}$ " " "	Oct. 19, 1915	Aug. 19, 1916	June18,1916
"	1	3/0 " "	9 " "	$\frac{1}{4}$ " " "	Dec. 4 " "	June 10, " "	June18 " "
"	1	1/0 " "	9 " "	$\frac{1}{4}$ " " "	May 20 " "	Aug. 14, 1915	Nov.18,1915
"	1	1/0 " "	9 " "	$\frac{1}{4}$ " " "	June 9 " "	Aug. 24, " "	Nov. 18 " "

Description of  
EUGENIA FALLS

Sec. No.	From	To	Length of Pole	Span	Miles	No. of Poles
EFL						
11	Hanover Jct. Pole 1491..	Hanover .....	40	125	.76	34
12	Eugenia Falls.....	Markdale.....			6.50	
		Car'd on Sec. EFL 1, poles				
13	Eugenia Falls .....	Flesherton.....			7.50	
		Car'd on Sec. EFL 3, poles				
14	Durham Jct. 1326 E.F.L.5	Holstein.....	30	130	2.63	107
		Car'd on Sec. EFL 5, poles				
15	Junction Pole 1141 .....	Kilsyth Sta.....	40	125	4.76	205
16	Kilsyth Station.....	Tara.....	40	125	6.80	292
17	Shelbourne .....	Orangeville .....	30	130	14.61	614
18	" .....	Horning's Mills .....	30	130	5.13	215
19	Eugenia Falls .....	Meaford Jct. Pole 186...	35-40	132	4.00	186
20	Meaford Jct. Pole 186...	Collingwood .....	35-40	132	20.17	885
21	Orangeville.....	Alton .....	30	132	5.75	253
22	Grand Valley .....	Arthur .....	30	120	12.50	539
25	Jct. Pole 1015 E.F.L. 5..	Durham Cement Co.....	35	125	.18	9
26	Hanover Sub-Station....	Carlsruhe Jet.....	30	132	3.70	108
27	Carlsruhe Jet .....	Carlsruhe .....	30	132	1.70	74
28	Carlsruhe Jet .....	Neustadt.....	30	132	2.31	94

MUSKOKA

M.L.						
1	South Falls.....	Huntsville .....	35	132	26.32	1,142

CENTRAL ONTARIO

C.O.S.						
1607	Napanee.....	Newburgh (Houpt Paper Mills).....	30	132	7.91	
(a)						
C.O.L.	Healey Falls.....	Trenton.....	40	176	30.53	975
49						
C.O.L.	Napanee Sub-Station..	Kingston.....	40	175	26.50	863
50						
C.O.L.	Trenton.....	Wellington .....	40	176	17.62	565
51						
C.O.L.	Wellington .....	Perth .....	40	176	12.65	345
52						

RIDEAU

R.L.I.						
1	High Falls.....	Perth .....	35	132	22.00	980
2	Perth.....	Smith's Falls .....	35	132	16.25	666
3	Smith's Falls .....	Merrickville.....	35	132	16.50	680

Lines.—Continued

SYSTEM

Voltage	No. of Cir- cuits	PowerCables B. & S. Gauge	Telephone Wires, B. & S. & B. W. G.	Ground Wire	Work Commenced	Work Completed	In Operation
22,000	1	1/0 S.R.Alum	9	“	Aug. 18, 1916	Sep. 16, 1916	Sep. 16, 1916
4,000	1	2 S.R	“	“	Dec. 28, 1915	Jan. 17 “	Feb. 8 “
4,000	1	2 S.R	“	“	June 4 “	Aug. 16, 1915	Nov. 18, 1915
4,000	1	2 S.R.	“	“	Dec. 10 “	Apl. 3, 1916	Apl. 3, 1916
22,000	1	6 B.W.G.Iron	9 B.W.G.Iron	1/4" Galv.Steel	Nov. 7, 1916	Jan. 31, 1917	Jan. 1, 1918
4,000	1	6 Copper....	9 “	1/4" “	Oct. 12 “	Jan. 19, 1917	Jan. 1, 1918
22,000	1	6 “ ....	10 “	1/4" “	June 13 “	June 15, 1916	June 13, 1916
22,000	1	6 “ ....	10 “	1/4" “	June 13 “	June 13 “	June 13 “
“	1	1/0 “ ....	9 “	1/4" “	Aug. 21 “	Oct. 5 “	Oct. 6 “
“	1	1/0 “ ....	9 “	1/4" “	Aug. 14 “	Oct. 5 “	Oct. 6 “
4,000	1	4 “ ....	“	6 B.W.G.Iron	Oct. 17 “	Nov. 22 “	Nov. 27 “
4,000	1	4 “ ....	“	6 “	Oct. 30 “	Feb. 19, 1917	Feb. 19, 1917
22,000	2	3/0 Alum..	9 BWG Iron	9/32 Steel..	Nov. 23, 1917	Jan. 31, 1918	Apl. 15, 1918
4,000	1	6 MHD. Cop.	“	6 BWG Iron.	Nov. 1, “	Dec. 12, 1917	Dec. 12, 1917
4,000	1	“	“	“	Sep. 26, 1918	Dec. 2, 1918	Nov. 17, 1918
4,000	1	6 DBWF. Cop	“	6 BWG .....	Oct. 10, “	Dec. 11, “	Nov. 17, “

SYSTEM

22,000	1	2 S.R. Alum	Galv. 9 B.W.G.Iron	1/4" Galv. Steel	Aug. 6, 1915	Apl. 29, 1915	Aug. 15, 1916
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SYSTEM

4,000 from Pole 1 to Pole 47 = .94 miles	1	6 Copper..	“	6 B.W.G.Iron	Nov. 23, 1916	Apr. 26, 1917	Apr. 23, 1917
44,000	1	2/0 B. & S. Copper	10 C.C. Steel	1/4" Steel	June 9, 1917	May 12, 1918	Jan. 22, 1918
44,000	1	1/0 B & S Bare Copper	9 B.W.G.Iron	1/4" “	Jan. 11, 1917	Nov. 7, 1917	Dec. 2, 1917
44,000	1	9/32 Steel.	9 BWG Iron	9/32" Steel	July 4, 1918	“	“
“	1	9/32 Steel.	9 “ “	9/32" Steel	July 24, 1918	“	“

SYSTEM

26,400	1	1 3/8 OSR Alum	9 BWG Iron	9/32" Steel.	“	“	“
26,400	1	1 3/8 “ “	9 “ “	9/32" “	Apl. 12, 1918	Oct. 9, 1918	“
26,400	1	5/16 Steel..	9 “ “	9/32 “	Nov. 27, 1917	June 12, 1918	Sep. 5, 1918

## Total Mileage of Lines and Number of Poles

	To Oct. 31st, 1917	Oct. 31st, 1917, to Oct. 31st, 1918	Total to Oct. 31st, 1918
Total mileage low tension lines completed .....	1,395.95	165.23	1,561.18
Total mileage low tension lines under construction..		98.27	98.27
Total mileage single circuit lines.....	1,184.82	263.32	1,448.14
Total mileage double circuit lines.....	369.34	.18	369.52
Total mileage three circuit lines.....	29.09		29.09
Total mileage four circuit lines.....	1.10		1.10
Total mileage telephone lines complete.....	1,173.53	149.54	1,323.07
Total mileage telephone lines under construction..		95.77	95.77
Number of poles .....63,379 }	63,821	9,477	73,298
Number of towers, ..... 442 }			

## Total Weights and Mileages of Cable and Wire

## TRANSMISSION AND TELEPHONE LINES

Cable and Wire	Wire Miles			Weight in Pounds		
	Completed to Oct. 31st, 1917	Completed Oct. 31st, 1917 to Oct. 31st, 1918	Under con- struction to Oct. 31st, 1918	Completed to Oct. 31st, 1917	Completed Oct. 31st, 1917 to Oct. 31st, 1918	Under con- struction to Oct. 31st, 1918
Aluminum .....	4,052.56	1.08	78.75	2,801,024	898	65,520
Steel Reinforced						
Aluminum....	649.93	76.68	114.75	327,482	69,242	103,619
Copper Wire.....	779.03	227.49	7.50	1,072,173	367,725	3,142
Copper Clad Steel	1,156.30	61.06	.....	221,063	9,403	.....
Galv. Iron Wire...	1,396.74	253.71	194.04	636,773	81,586	59,851
Galv. Steel						
Cable....	1,225.41	340.52	189.58	778,100	317,967	91,860
Totals.....	9,259.97	960.54	584.62	5,836,615	846,821	323,992



The Mileage of Lines Tabulated According to Voltage and Number of Circuits  
Transmission Lines

—	Single Circuit Totals				Double Circuit Totals				Three Circuit Totals				Four Circuit Totals				1-2-3-4-Circuit Totals			
	Completed Oct. 31, 1917	Completed Oct. 31, 1917	Under Construction Oct. 31, 1918	Completed Oct. 31, 1917	Completed Oct. 31, 1917	Under Construction Oct. 31, 1918	Completed Oct. 31, 1917	Completed Oct. 31, 1917	Completed Oct. 31, 1917	Completed Oct. 31, 1917	Under Construction Oct. 31, 1918	Completed Oct. 31, 1917	Completed Oct. 31, 1917	Completed Oct. 31, 1917	Under Construction Oct. 31, 1918	Completed Oct. 31, 1917	Completed Oct. 31, 1917	Under Construction Oct. 31, 1918	Completed Oct. 31, 1917	Completed Oct. 31, 1918
Voltage																				
46,000 }	1.93	79.55	57.52				15.50									17.43	79.55			
44,000 }																				
26,400..	278.50	16.50	38.25	124.15			11.46					1.10				415.21	16.50	38.25		
22,000..	206.42	50.20		142.67	.18											349.09	50.38			
13,200..	308.84	3.11		88.54			.09									397.47	3.11			
12,000..				1.56												1.56				
6,600..	13.00			3.75			2.04									18.79				
4,000..	177.23	15.69	2.50													177.23	15.69	2.50		
2,200..	18.54			.63												19.17				
Total.	1,004.46	165.05	98.27	361.30	.18		29.09					1.10				1,395.95	165.23	98.27		1,561.18

Gauge, Length and Weight of Conductors  
TRANSMISSION LINES

Browne & Sharpe Gauge	Wire Miles		Weight Pounds		Miles Single Circuit Lines			Miles Double Circuit Lines			Total Single Circuit and Double Circuit Lines completed Oct. 31, 1918
	Completed to Oct. 31, 1917	Completed Oct. 31, 1917, to Oct. 31, 1918	Completed to Oct. 31, 1917	Completed Oct. 31, 1917, to Oct. 31, 1918	Under construc- tion to Oct. 31, 1918	Comple- ted Oct. 31, 1917, to Oct. 31, 1918	Under construc- tion to Oct. 31, 1918	Comple- ted to Oct. 31, 1917	Com- pleted Oct. 31, 1917 to Oct. 31, 1918	Under construc- tion to Oct. 31, 1918	
400,000 c.m. Alum.	1.54	.....	3,032	.....	.....	.49	.....	.....	.....	.....	.49
4/0 Aluminum.....	183.85	.....	243,049	.....	.....	.....	.....	30.49	.....	.....	30.49
3/0 ".....	2,087.88	.....	737,950	898	65,520	217.50	26.25	221.93	.18	.....	439.61
2/0 ".....	89.96	.....	58,954	.....	.....	.....	.....	14.20	.....	.....	14.20
1/0 ".....	1,045.01	.....	546,539	.....	.....	225.16	.....	53.25	.....	.....	278.41
2 ".....	644.82	.....	211,500	.....	.....	117.85	.....	43.43	.....	.....	161.28
2 S.R. ".....	610.06	.....	296,942	.....	.....	194.33	.....	.....	.....	.....	194.33
1 1/2 S.R. ".....	.....	76.68	.....	69,242	103,619	.....	38.25	.....	.....	.....	25.56
1/0 S.R. ".....	39.87	.....	30,540	.....	.....	12.66	.....	.....	.....	.....	12.66
250,000 c.m. Copper	1.54	.....	6,246	.....	.....	.49	.....	.....	.....	.....	.49
4/0 Copper.....	154.35	.....	520,931	.....	.....	.....	.....	16.75	.....	.....	16.75
2/0 ".....	34.59	.....	74,893	197,926	.....	10.77	30.53	.....	.....	.....	41.61
1/0 ".....	147.59	.....	1,250,482	135,945	.....	31.43	26.50	8.10	.....	.....	66.03
2 ".....	10.71	.....	11,331	.....	.....	3.40	.....	.....	.....	.....	3.40
4 ".....	107.75	.....	72,583	27,494	.....	33.82	13.74	.....	.....	.....	48.19
6 ".....	322.50	.....	135,707	6,360	3,142	103.69	5.06	.....	.....	.....	108.75
1/4 in. Steel Cable.	28.80	.....	19,929	76,066	.....	9.60	.....	.....	.....	.....	9.60
9/32 ".....	.....	29.75	.....	25,139	71,664	.....	28.27	.....	.....	.....	.....
7/16 ".....	.....	190.98	.....	216,762	20,196	.....	3.00	.....	.....	.....	.....
5/16 ".....	.....	.....	.....	.....	.....	.....	63.66	.....	.....	.....	63.66
6 B.W.G. Iron ....	185.01	15.69	109,155	8,990	1,432	61.67	.....	.....	.....	.....	61.67
Totals.....	5,695.33	661.46	5,329,763	764,822	265,573	1022.86	98.27	389.09	.18	.....	1,577.18

NOTE.—A total of 18.00 miles occurs twice in the total mileage, due to this being a double circuit.

## Size of Telephone Wire used on Telephone Lines

COMPLETED OCT. 31, 1917-OCT. 31, 1918

Section No.	Mileage	Gauge	Section No.	Mileage	Gauge
L.T. 164.....	22.52	No. 9 B.W.G. Galv. Iron			
" 179.....	3.11	9 " "			
E.F.L. 25.....	.18	9 " "			
S.L. 24.....	3.88	9 " "			
" 25.....	4.28	9 " "			
" 26.....	5.99	9 " "			
" 27.....	2.24	9 " "			
" 28.....	7.35	9 " "			
" 29.....	1.82	9 " "			
" 30.....	6.30	9 " "			
" 31.....	3.61	9 " "			
" 32.....	1.76	9 " "			
" 33.....	3.87	9 " "			
" 34.....	7.25	9 " "			
" 35.....	1.85	9 " "			
C.O.L. 49.....	30.53	10 B. and S.C. Steel			
C.O.L. 50.....	26.50	9 B.W.G. Galv. Iron			
R.L. 3.....	16.50	9 " "			
Total.....	149.54	.....	Total.....	.....	.....

## Size of Telephone Wire used on Telephone Lines

UNDER CONSTRUCTION OCT. 31, 1918

Section No.	Mileage	Gauge	Section No.	Mileage	Gauge
C.O.L. 51.....	E 17.45	9 B.W.G. Galv. Wire			
C.O.L. 52.....	E 10.82	9 " "			
R.L. 1.....	E 22.00	9 " "			
R.L. 3.....	E 16.25	9 " "			
St. L. 8.....	E 26.25	9 " "			
St. L. 12.....	E 3.00	9 " "			
Total.....	95.77	.....	Total.....	.....	.....

" E " estimated

Gauge, Length and Weight of Copper Clad Steel and Galvanized Iron Wire  
TELEPHONE LINES

Gauge	Wire Miles				Weight in Pounds				Single Circuit Mileage			
	Completed to Oct. 31st, 1917	Completed Oct. 31st, 1917	Under con- struction to Oct. 31st, 1918	Completed and under con- struction to Oct. 31st, 1918	Completed to Oct. 31st, 1917	Completed Oct. 31st, 1917	Under con- struction to Oct. 31st, 1918	Completed and under con- struction to Oct. 31st, 1918	Completed Oct. 31st, 1917	Completed to Oct. 31st, 1917	Under con- struction to Oct. 31st, 1918	Completed and under con- struction to Oct. 31st, 1918
No. 8 B. & S., C.C. steel..	207.52	.....	.....	207.52	50,842	.....	.....	50,842	103.76	.....	.....	103.76
No. 10 " "	945.84	61.06	.....	1,006.90	172,235	9,403	.....	181,638	472.92	30.53	.....	503.45
No. 9 B.W.G. Galv. iron..	1,010.84	238.02	191.54	1,440.40	359,953	72,596	58,419	490,968	505.42	119.01	95.77	720.20
No. 10 " "	283.32	.....	.....	283.32	70,580	.....	.....	70,580	141.66	.....	.....	141.66
Totals....	2,447.52	299.08	191.54	2,938.14	653,610	81,999	58,419	794,028	1223.76	149.54	95.77	1,469.07



The conductor materials inspected during the past year for all purposes are as follows:

W.P. and Rubber Covered Copper for all purposes.....	30,985 lbs.
Bare Copper, similarly .....	125,520 "
New Aluminum Conductor .....	495,000 "
Refabricated Aluminum .....	300,000 "
Steel and Iron Conductor for all purposes, including ground wire, guying and telephone .....	350,000 "

Along with other materials, the following insulators were inspected for the various services during the past year:

Guy Strain .....	7,365
Telephone and Distribution .....	99,375
13,200 Volts .....	6,500
22,000/26,400 Volts .....	15,750
44,000 Volts .....	8,700
110,000 Volt Units .....	25,700
Total.....	163,390

## SECTION III

### OPERATION OF THE SYSTEMS

#### Niagara System

An analysis of the conditions on the Niagara System, for the past year shows that from a purely operating viewpoint it has been the most remarkable and satisfactory period in the history of the Commission.

The outstanding feature was the absence practically of all interruptions from failure of lines and station equipment. Notwithstanding this, the operation of the system required constant and very careful attention, involving almost hourly readjustment of the load. The primary cause was insufficient electrical energy for transmission and the scattered location of munition industries.

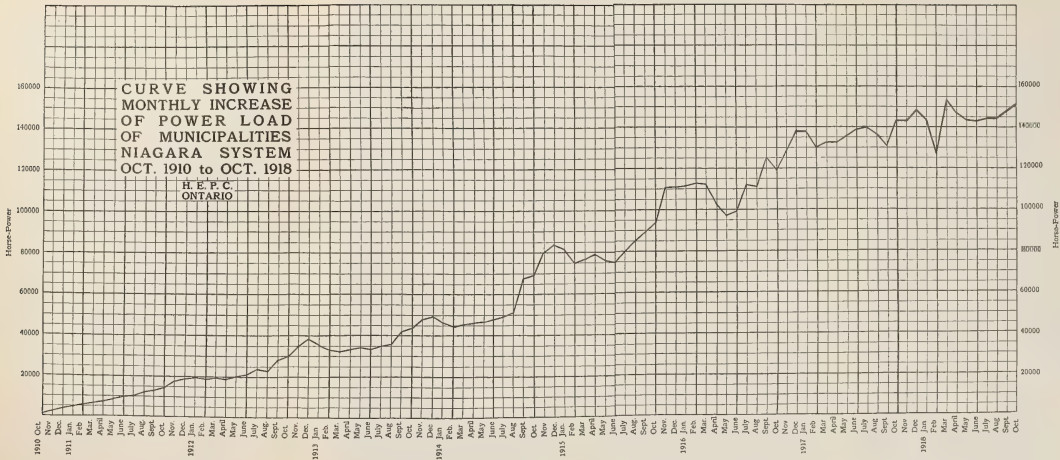
Early in the year the Dominion Government passed an order-in-council appointing a Power Controller and vested him with the right of determination of war essentials and absolute direction of the supply of all the available electrical energy generated by all power companies, including the Commission, required for the production of munitions. These industries, which increased month by month, were given uninterrupted service.

From December 23rd to March 1st the available capacity at Niagara Falls was decreased by 20,000 horse-power due to the failure of two generators at the Canadian-Niagara Power Company's plant. Another failure occurred on May 28th causing a shortage of 10,000 horse-power for one month. This company also experienced considerable loss of output through ice trouble which was unusually severe during the winter of 1917-1918. In the summer and fall, however, this company maintained a practically continuous supply of 50,000 horse-power.

The greatest burden of wartime production in the Niagara District and Western Ontario, perhaps rested on the Ontario Power Company, which has been controlled and operated by the Commission since August 1st, 1917. The generating station was operated at the maximum safe overload continuously, and only the vital need of power for war munitions justified the overloading mentioned. The advantage gained through the unified control of the Ontario Power Company and the Commission was strikingly illustrated.

The weather conditions during the winter of 1917-1918 were unusually severe and the operating difficulties experienced as the result of ice trouble were the worst in the history of the plant. On account of the ice conditions the output was slightly reduced for short periods and owing to the urgent demand for power these shortages were felt very acutely, but when the severity of the winter is taken into account the operation of the plant compares most favorable with previous years. Studies have been made of the ice conditions and precautionary measures are being taken to minimize as far as possible the loss of output due to ice in the future.

In view of the load carried, it was not feasible to proceed with some of the proposed changes in the physical arrangement of the plant. However, some slight alterations were effected which increased the already highly developed facilities of the plant for selective switching of the different units to the outgoing lines supplying the variable demand. Unfortunately, labor shortage and difficulty in obtaining equipment and materials prevented the completion of the No. 3







pipe line in the present fiscal year. Arrangements, however, are complete for the temporary installation of one of the new generators, purchased for use with the new pipe line, on the floor of the present power house, to operate as a synchronous condenser. This will materially assist in reducing the heavy current carried by the other generators, by absorbing a part of the wattless component of the power delivered, thus increasing the energy output of the plant.

The period during the past year in which electrical storms occurred extended from February 14th to October 6th. On the whole, the storms were probably not quite as severe as in some of the previous years. Eight disturbances traversed the entire system, of which four were severe and were accompanied by high winds. Only one system interruption of a few minutes duration resulted from lightning discharges.

The operation of the 110,000-volt lines during the past year has completely justified the confidence which the Commission places in its transmission medium of high voltage power. Although some very severe wind and sleet storms were experienced, no breaks in the copper or steel reinforced aluminum cables were reported.

The Commission in common with all other employers of labor was handicapped through voluntary enlistment and conscription and the operating staff was seriously depleted. This was in a great measure overcome by the purchase of trucks and cars for the transportation of maintenance men, patrolmen and meter inspectors over the large area to be covered thus enabling the individual employee to accomplish much more work in less time. This means of transportation has proved very successful both with regard to economy and efficiency.

An important undertaking completed by the Line Maintenance Department comprised the removal of the 4/0 straight aluminum cable of both circuits of the old tower line between Niagara Falls and Dundas and the restringing with 6/0 steel reinforced aluminum cable for the purpose of increasing the current carrying capacity of these circuits. The old cable, together with some left over from the restringing of Section "B" last summer, was shipped to the factory for refabrication. Some change was made in the insulators on some of the towers on account of the higher stresses impressed by the use of the reinforced cable. On account of the increased conductivity and consequent decrease of power loss, it is estimated the delivery of power is increased nearly 2 per cent. with a corresponding benefit in voltage regulation.

The two and three quarter mile circuits between the Stratford High Tension Station and the Municipal Substation were changed from 13,000 to 26,400-volt construction. This work was done by the Commission and paid for by the Municipality of Stratford as owner of these circuits. All power from the high tension station is now fed at the same voltage with improved operation.

In practically all cases the Commission had sufficient station apparatus installed to take care of the load for 1918. The power factor of some of the municipal industries was not good and this increased the current loading on the transformers to overload proportions. This also affected voltage regulation to some extent.

Following present engineering practice the Commission has made progress in improvement of voltage regulation by the installation of synchronous condensers. Two 4,000-kv-a. units installed in the building adjoining the Toronto high tension station were turned over for operation on August 1st. While assisting the maintenance of normal voltage this installation has benefited the entire system by reducing the idle current borne by the generating units at Niagara, conse-

quently increasing the capacity for delivery of energy. On December 14th, 1917, the output of the Erindale generating station, purchased by the Commission, was added to the Niagara System through a frequency changer set installed at the Cooksville high tension station. This equipment has been described in detail in another report. The hydraulic power at Erindale is limited under present conditions, so through a portion of the day the 1,000-kv-a., 25-cycle generator at the Cooksville Station is operated as a synchronous condenser for voltage regulation and for supplying wattless current to the entire system.

Constant inspection of all equipment was made by the Station Maintenance Department along with careful tests of the insulating material used, special attention being given to oil filtration to assure the absence of moisture. This department has undertaken very successfully the replacement of windings, etc., in transformers and rotating apparatus, equaling the skilled workmanship of factory production to be had under present conditions. In carrying on this class of work it became possible to ascertain and call for certain changes in design, of paramount importance from an operating standpoint.

An important transfer of transformer capacity between high tension stations comprised the removal from Toronto Station of seven 2,500-kv-a. units which had been replaced by 5,000-kv-a. units, to the Dundas Station. Four 1,250-kv-a. units were then removed from Dundas Station and installed in the Guelph Station. In addition to the above, one 750-kv-a. unit was removed from the Preston Station and installed in the Kitchener Station. These transfers greatly increased the margin of available capacity at the stations named.

The Meter Department, apart from the regular inspection and adjustment of the meters and relays, conducted investigations in the field, of a research nature, with special reference to protective equipment. Pole type outdoor metering equipment was designed and erected by this department to measure the power supplied to several of the smaller municipalities.

The following table gives a comparison of the load of the various municipalities in October, 1917, and October, 1918. It will be noted that on account of the shortage of power and consequent restriction the normal yearly increase could not be taken care of.

Municipality	Load in H.P. Oct., 1917	Load in H.P. Oct., 1918	Increases
Toronto .....	50,167	56,139.5	5,972.5
Dundas .....	597	496.5	.....
Hamilton .....	11,622	12,097.8	475.8
Waterdown .....	65	80.4	15.4
Caledonia .....	53.6	55.6	2
Hagersville .....	99	115.3	16.3
London .....	8,552.5	8,427.5	.....
Thorndale .....	22.8	56.3	23.5
Thamesford .....	20.1	68.3	48.2
Guelph .....	3,075	2,835	.....
Ontario Agricultural College .....	146.7	126.5	.....
Military Hospitals Commission .....	182.3	165	.....
Rockwood .....	12.3	35	22.7
Georgetown .....	348.3	364	15.7
Acton .....	192	151.5	.....
Preston .....	1,150	949	.....
Galt .....	2,466.5	2,922.2	455.7
Hespeler .....	338	307	.....
Breslau .....	30	30	.....
Kitchener .....	4,280	3,827	.....
Waterloo .....	862	792.2	.....
Elmira .....	134	175.6	41.6
New Hamburg .....	162.2	187.6	25.4
Baden .....	153	142.9	.....
Stratford .....	1,519	1,374	.....
Mitchell .....	175.6	183.6	8
Seaforth .....	536	564.3	28.3
Clinton .....	106	134.9	28.9
Goderich .....	264.6	363.3	98.7
St. Marys .....	396.7	382.6	.....
Woodstock .....	1,331	1,179.6	.....
Ingersoll .....	858	870	12
Tillsonburg .....	296	718.5	412.5
Norwich .....	252.6	191.7	.....
Beachville .....	167.6	191	23.4
St. Thomas .....	2,037.5	1,843.2	.....
Port Stanley .....	70.4	61.6	.....
Brantford .....	2,536	2,694.4	158.4
Paris .....	365.5	545.6	189.1
Port Credit .....	67	59.6	.....
Weston .....	754	791.4	37.4
Brampton .....	933	891.4	.....
Milton .....	334	299.4	.....
Mimico .....	184	174.5	.....
Mimico Asylum .....	30.8	37.5	6.7
Prov. Brick Yard .....	128.7	104.5	.....
New Toronto .....	1,509.5	2,345.8	836.3
Toronto Township .....	45	152.8	107.8
Cooksville .....	30	46.9	16.9
Dixie .....	.....	.....	.....
Windsor .....	1,852	1,745.2	.....
Walkerville .....	1,972	2,571	599
Elora .....	130.3	162.8	32.5
Fergus .....	82.8	131	48.2
Welland .....	4,183	7,177.2	2,994.2
St. Catharines .....	4,520	5,263	743
Port Dalhousie .....	87.1	85.8	.....
Strathroy .....	291.6	279.4	.....
Drumbo .....	14.8	19.5	4.7
Plattsville .....	60.3	52.5	.....
Woodbridge .....	86.6	134	47.4
Ayr .....	43	46	3
Princeton .....	10.3	10.4	.1
Embro .....	27.3	26	.....
Chatham .....	888.7	1,195	306.3
Lucan .....	142	118.3	.....

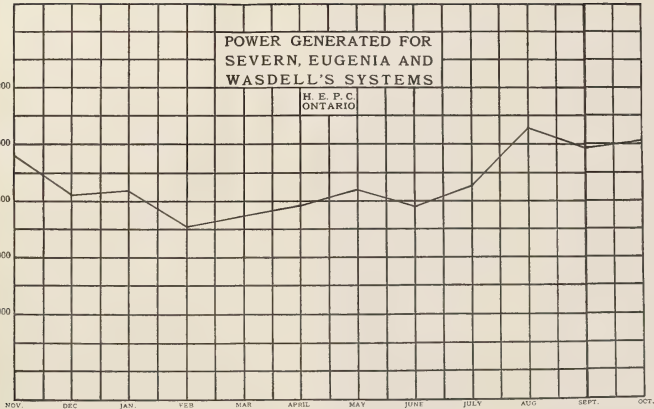
Municipality	Load in H.P. Oct. 1917	Load in H.P. Oct. 1918	Increases
Bolton .....	96.5	71.4	.....
Mount Brydges .....	25.7	24.5	.....
Wallaceburg .....	419.5	601.8	182.3
Delaware .....	8	7.6	.....
Tilbury .....	66.3	88.5	22.2
Simcoe .....	131.4	136.7	5.3
Waterford .....	105.6	99.2	.....
Lambeth .....	18.5	16.7	.....
Grantham Township .....	10.1	26.8	16.7
Dresden .....	70.6	197.6	127
Dorchester .....	14.7	16	2.7
Comber .....	20	19.3	.....
Burford .....	32.7	33.5	.8
Bothwell .....	62.5	50.1	.....
St. George .....	30.1	65.7	35.6
Dutton .....	44.5	103.2	58.7
Thamesville .....	42.2	42.2	.....
Blenheim .....	81.7	107.2	81.7
Lynden .....	83.7	81.2	.....
Ailsa Craig .....	80.4	51.6	.....
Otterville .....	13.4	21.4	8.0
Exeter .....	123.3	134	10.7
Granton .....	41.3	52.2	10.9
Niagara Falls .....	2,304	2,181	.....
Petrolia .....	284	341.8	57.8
Wyoming .....	28	25.7	.....
Ridgetown .....	136.3	120	.....
Milverton .....	189	253	64
Listowel .....	184.5	292.2	107.7
Palmerston .....	88.5	77.7	.....
Harriston .....	98	71.3	.....
Tavistock .....	220	251.2	31.2
Wellesley .....	114.6	110	.....
Burgessville .....	35	28.8	.....
St. Jacobs .....	72.4	33.5	.....
Stamford Township .....	454.4	349	.....
Sarnia .....	1,126	1,172	46
Highgate .....	18.7	18.7	.....
Forest .....	69.3	109.3	40
Watford .....	49.6	40.7	.....
Dublin .....	7.5	26.2	18.7
Rodney .....	31	28.5	.....
West Lorne .....	25.5	27	1.5
Etobicoke Township .....	97.8	169	71.2
Hensall .....	26.8	174.6	97.8
Dashwood .....	35	45.5	10.5
Zurich .....	55	53.5	.....
Springfield .....	21.4	19.4	.....



POWER GENERATED FOR  
SEVERN, EUGENIA AND  
WASDELL'S SYSTEMS

H. E. P. C.  
ONTARIO

Horse Power





Municipality	Date connected	Initial Load in H.P.	Load in H.P. Oct., 1918	Increases
Moorefield .....	Feb. 22, 1918 .....	5	8.4	3.4
Drayton .....	Feb. 32, 1918 .....	15	28	13
Aylmer .....	Feb. 11, 1918 .....	134.6	129.3	.....
Brigden .....	Dec. 7, 1917 .....	10.8	30.2	19.4
Oil Springs.....	Dec. 6, 1917 .....	25.4	92.5	67.1
Dunnville .....	May 21, 1918 .....	60	138	78

Severn System

The operation of the Severn System during the past year was attended with very satisfactory results. Although the power demand for munitions and war supplies on this system was proportionately as great to that on the Niagara System, the Commission was not obliged to adopt any system of load restriction.

In November and December, 1917, a considerable amount of power was supplied to the Orillia Commission by parallel operation of the Big Chute and Wasdell's Generating Stations. This was during the period that the Orillia Commission was changing over their source of supply from the power development at Ragged Rapids to the new development with increased capacity at Swift Rapids. During the month of January the Wasdell's plant was operated in parallel with the Swift Rapids plant to help meet the power demand on the Orillia System, which could not be taken care of by the Swift Rapids Generating Station at that time.

On April 22nd, the short stretch of three phase, 22,000-volt line connecting the old tie line between the Big Chute and Ragged Rapids to the Swift Rapids Plant was completed and this plant and the Big Chute Plant were paralleled for test. Regular parallel operation was commenced on June 1st between the Eugenia, Big Chute, Swift Rapids and Wasdell's Plants and has proved very advantageous to both the municipality of Orillia and to the Commission in maintaining good voltage and speed regulation, continuity of service and has also permitted the transfer of excess capacity from the Wasdell's and Eugenia Plants to the Severn System for distribution to the municipalities supplied therefrom.

No serious failures of the equipment in the power house transmission lines or the distribution stations on the Severn Systems were reported.

At the power house the 66-inch gate valve controlling the No. 3 unit from No. 1 penstock was replaced by a butterfly valve. The thrust bearings on all units were equipped with water cooling coils with good results. Certain alterations were made in the metering equipment to take care of the conditions imposed by parallel operation. Extensive tree trimming was required along some of the transmission line sections, which was carried out during the summer. The excessive growth of underbrush along seven miles of the Tie Line right-of-way between the Big Chute and Swift Rapids Plants and also along eight miles between the Big Chute Plant and the Waubaushene switching station was cleared.

A new entrance structure was erected at the Big Chute Power House to support all high tension and low tensions lines entering and leaving this station. A station horn gap line entrance switch was erected in the line entrance to the Victoria Harbor Station. Two horn-gap air-break line switches were erected in the circuits of the tap line serving the C.P.R. elevator at the junction of these circuits with the trunk lines. These switches were erected for sectionalizing purposes.

## Severn System

Municipality	Load in H.P. Oct., 1917	Load in H.P. Oct., 1918	Increases
Midland .....	1,088.5	1,372.6	292.1
Penetang .....	435.6	362	.....
Collingwood .....	1,986	1,808.2	.....
Barrie .....	487.2	517.4	30.2
Coldwater .....	36.8	38.8	2
Elmvale .....	47	110.5	63.5
Stayner .....	54	127.4	73.4
Creemore .....	47	42.2	.....
Waubashene .....	22.7	20.9	.....
Port McNicholl .....	34	22.5	.....
Victoria Harbor .....	28.4	23.8	.....
Camp Borden .....	323	287	.....
C.P.R. Elevator .....	1,160.1	1,047	.....

## New Municipalities—Severn System

Municipality	Date connected	Initial Load, H.P.	Load in H.P. Oct. 1918	Increases
Cookstown .....	April 25, 1918 .....	30	55.2	25.2
Alliston .....	May 23, 1918 .....	64.3	90	25.7
Bradford .....	Sept. 16, 1918 .....	25.7	25.7	.....
Beeton .....	July 26, 1918 .....	45	98.5	53.5
Tottenham .....	Sept. 9, 1918 .....	31.3	31.3	.....
Thornton .....	Oct. 16, 1918 .....	7	7	.....

## Eugenia System

The quantity of power delivered to the municipalities of the Eugenia System was increased during the year. Continuous service was assured as a result of parallel operation of the generating station at Eugenia Falls with the Big Chute Power House.

Certain additions and alterations were completed at the power house to facilitate parallel operation and the measurement of the power supplied over the Eugenia-Collingwood tie line to the Severn System. Several changes were also made in the line entrance structure at the Eugenia Power House. Each high tension outgoing line to the Eugenia System and to the tie line is now individually provided with standard equipment. Other changes were made to accommodate operation pending the completion of the extension to this plant.

The two-pole line entrance structure at the Collingwood Distributing Station was remodelled to improve operating conditions at this station, which is the junction point between the Severn System and the Eugenia tie line. Engineering and supervising assistance was rendered to the East Grey Telephone Company in eliminating trouble on their circuits due to inductive interference from exposure to the Commission's transmission line at certain points between Durham and Hanover.



## Eugenia System

Municipality	Load in H.P. Oct., 1917	Load in H.P. Oct., 1918	Increases
Owen Sound.....	978.5	937	.....
Flesherton .....	33.5	31.6	.....
Dundalk.....	75.3	77.4	2.1
Durham .....	60.3	62.2	1.9
Mount Forest.....	106.2	103	.....
Chatsworth.....	15.2	31.6	16.4
Markdale.....	73	63.2	.....
Holstein.....	6.4	6.4	.....
Chesley .....	90	106.2	16.2
Shelbourne.....	94.7	136.7	42.0
Orangeville.....	94.5	119.3	24.8
Horning's Mills .....	4.7	5.3	.6
Grand Valley.....	41.5	56.3	14.8
Arthur .....	41	131.7	90.7
Alton Foundry Co .....	55.2	38.6	.....

## New Municipalities

Municipality	Date connected	Initial Load H.P.	Load in H.P. Oct., 1918	Increases
Hanover .....	Dec. 12, 1917 .....	261.6	475.8	214.2
Tara .....	Jan. 1, 1918 .....	30	37.5	7.5
Elmwood .....	Mar. 1, 1918 .....	51.3	44.2	.....
Nat. Portland Cement Co.....	May 7, 1918 .....	25	666.2	641.2
Carlsruhe and Neustadt .....	Dec. 12, 1918 .....	8	9.3	1.3

## Muskoka System

Continued improvement characterized the operation of the Muskoka System during the past year and excellent service was maintained.

Adjustments and repairs were carried out for the manufacturer, by the Maintenance Department, on the new turbine in the generating station at South Falls, to put this unit in good operating condition. This department has also installed a water cooled bearing and cooling coil purchased under contract from the Canadian General Electric Company, on the main bearing of the 750-kv-a. generator installed at this plant.

Increased accommodation for stores and repair work on account of the isolated position of the plant was provided by moving and combining several of the buildings on the power house site. A telephone circuit was erected between Huntsville Distributing Station and the office of the Anglo-American Leather Company to facilitate operation.

## Wasdell's System

Good operation was maintained without difficulty on Wasdell's System during the past year. Inspection reports indicate that the power house at Wasdell's Falls, the transmission lines and the two distributing stations at Beaverton and Cannington are in first class operating condition.

As the power requirements of the municipalities connected to this system were insufficient to load the generating station, the surplus capacity was again transferred through parallel operation to the Severn System and was very conveniently utilized. Several improvements of a minor nature were effected in and about the power house during the year.

### St. Lawrence System

The Commission's system on the St. Lawrence River was hampered in expansion, to some extent, during the past year, by shortage of power. Although the entire output of the M. F. Beach Company's hydraulic plant at Iroquois was utilized continuously, it was necessary to operate the Brockville municipal steam plant to maintain first class service. An adequate power supply will be guaranteed to the municipalities of this system early in 1919 when the Commission's 110,000-volt transformer station at Cornwall is made alive from the transmission lines of the Cedars Rapids Power Company.

The Commission's transformer stations and lines are reported in excellent operating condition; no failures worthy of mention having occurred. The actual operation and maintenance of this system is now directed from the operating centre of the Central Ontario System at Belleville for economic reasons.

### Wasdell's System

Municipality	Load in H.P. Oct., 1917	Load in H.P. Oct., 1918	Increases
Beaverton .....	60.3	72.1	11.8
Brechin .....	53.6	9.3	.....
Cannington .....	68.4	79.7	11.3
Sunderland .....	41.5	54.9	13.4
Woodville .....	51.2	45.5	.....

### Muskoka System

Municipality	Load in H.P. Oct., 1917	Load in H.P. Oct., 1918	Increases
Gravenhurst .....	321.7	319.6	.....
Huntsville .....	597.8	583	.....

### St. Lawrence System

Municipality	Load in H.P. Oct., 1917	Load in H.P. Oct., 1918	Increases
Brockville .....	368.5	327.7	.....
Prescott .....	191.3	178.8	.....
Winchester .....	69.7	76.4	6.7
Chesterville .....	87.8	140	52.2
Williamsburg .....	21	22.5	1.5

### Central Ontario System

The growth of the load for a number of years on the Central Ontario System has been very rapid and regular and all indications during the past year pointed to an increase so great that the available power would have failed to meet the demands, even with the assistance of local steam and hydraulic plants at the disposal of a few of the municipalities supplied. This condition did not arise, however, owing to a disastrous fire in October which destroyed the British Chemical Company's plant at Trenton, leaving a considerable quantity of power, usually consumed by Trenton, available for distribution at other points of the system. The operation has been very satisfactory and promises to continue so, as the decrease in power required for the manufacture of munitions will prevent a shortage occurring before an additional unit at Healey Falls is available.

The condition of the high tension lines of the system when taken over by the Commission was not sufficiently good to maintain the standard of service required of them. The matter of re-insulating all these lines is being considered and progress has been made between Belleville and the Canada Cement Company, also Belleville and Port Hope. The Fenlon Falls-Lindsay Line has been put into first class condition and the regulation and capacity of the Port Hope-Oshawa line will shortly be improved by the installation of a synchronous condenser at Oshawa. This machine was one of the generators in the old Otonabee power house. By some alterations, including the addition of interconnected pole collars, it has been put in a condition satisfactory for use as a synchronous condenser and when operated as such, will, it is expected, have a beneficial effect on the operation of the system as a whole.

At Peterborough, owing to the increased load taken by the municipality and the street railway, and to the fact that the Commission's contract with the Quaker Oats Company for the supply of 1,500 horse-power expired July 31st, it was deemed advisable to make use of the equipment in the old Otonabee sub-station, rather than build a new distributing station until such time as prices became normal. This equipment consisted of six 250-kv-a. transformers also one 750-kw. transformer owned by the municipality, only, one 750-kw. transformer being purchased for the station. The line from the Commission's power house to the sub-station was rebuilt and one additional circuit of No. 00 copper wire was added, giving three circuits in all. The municipality's circuits were transferred from the Quaker Oats Company's power house to this sub-station, which is now operated as a joint sub-station by the municipality and the Commission. The equipment of the street railway was also installed in a galvanized iron building adjacent to the sub-station, to which one additional motor generator set is now being added. The station was put into operation in September.

New distributing stations at Kingston and Omemee have been operating since early in the year with very satisfactory results.

## Central Ontario System

Municipality	Load in H.P. Oct., 1917	Load in H.P. Oct., 1918	Increases
Belleville.....	1,513	2,053	540
Bowmanville .....	1,140	1,106	.....
Brighton .....	90	70	.....
Coburg .....	522	523	1
Colborne .....	80	75	.....
Desoronto .....	355	322	.....
Kingston .....	.....	1,285	1,285
Lindsay .....	1,540	1,328	.....
Madoc.....	126	101	.....
Millbrook.....	31	38	7
Napanee .....	275	319	44
Newcastle.....	24	21	3
Newburg & Camden East.....	295	25	278
Omeme.....	.....	20	20
Orono .....	24	21	3
Oshawa .....	1,815	1,559	256
Peterboro .....	4,020	3,800	225
Port Hope .....	435	503	68
Stirling .....	80	84	4
Trenton .....	4,800	6,135	1,335
Tweed .....	127	68	.....
Whitby.....	260	245	.....

## Central Ontario System

COMPARISON OF POWER GENERATED—FISCAL YEAR—1917-1918.

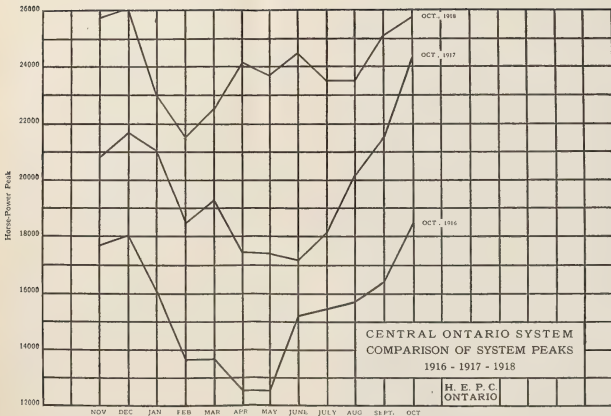
Month	Peak Load H.P. 1917	Peak Load H.P. 1918	Increase H.P.
1917			
November.....	20,800	25,800	5,000
December .....	21,700	26,100	4,400
1918			
January.....	21,100	23,000	1,900
February .....	18,600	21,600	3,000
March .....	19,320	22,600	3,280
April .....	17,500	24,200	6,700
May .....	17,400	23,800	6,400
June .....	17,210	24,600	7,390
July .....	18,200	23,500	5,300
August.....	20,200	23,500	3,300
September .....	21,500	25,100	3,600
October .....	24,400	25,800	1,405

## Ottawa System

Continued expansion was experienced in the operation of the Ottawa System during the past year. The increase in the power requirements of the municipality exceeded 1,000 horse-power and at least 500 horse-power more will be required to meet the demand in the winter months, which will probably total 7,000 horse-power. The power supply from the Ottawa and Hull Power and Manufacturing Company was continued with the usual high standard with regard to continuity of service and operating characteristics.

The waterworks pumping station at Lemieux Island was initially fed from the power company's station at 11,000 volts on November 12th, 1917. The power







required by this utility amounts to approximately 2,000 horse-power. The necessary meter equipment was installed by the Meter Department to provide graphic records of the total load and also a separate graphic record of the waterworks load.

### Port Arthur System

The operation of the Port Arthur System during the years was very satisfactory. The actual increase in the power taken by the municipality of Port Arthur from the Commission's transforming station amounted to 1,600 horse-power.

Several times during the year the Commission was obliged to increase the power held in reserve from the Kaministiquia Power Company which now totals 5,000 horse-power, incidentally reducing the cost of power. The quality of the service supplied by the Kaministiquia Power Company was entirely reliable and the performance of the Commission's station and transmission lines was all that could be desired.

The erection of a wood pole entrance and switching structure outside the transformer station, which was commenced last year was completed and has proved very beneficial with regard to selective switching on the high tension lines.

As additional current transformers were installed in the incoming and outgoing 22,000-volt lines at the transformer station to provide improved relay protection. As a result of this installation it will now be possible to operate the incoming lines from the Kaministiquia Power Company's power house in parallel, with safety and with improved regulation. The oil system at this station has been extended and improved. The old type of chemical filter was removed and the standard type of filter press has been installed. Additional oil storage has been provided and oil piping was installed to increase the flexibility of this system. During the summer all insulating oil in the transformers and oil switches was thoroughly filtered and the switches overhauled mechanically.

### Rideau System

The first step toward placing the Rideau System in operation was made on September 15, 1918, when a portion of the system consisting of the 26,400-volt transmission line between Merrickville and Smith's Falls and the transformer station at Smith's Falls was tested out and made alive.

The Commission's only source of supply at the present time is the Rideau Power Company at Merrickville. Power is generated by this company at 600 volts and stepped up to 26,400 volts for transmission. The quantity of power held in reserve will be adequate to meet the immediate demand when the local hydraulic plants at Smith's Falls and Perth are paralleled with the supply from Merrickville. The present peak load of this system amounts to 450 horse-power. To provide for the rapid growth expected the development of High Falls was undertaken. Construction work is now under way.

## HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO

Detailed Statement of Assets and Liabilities—31st October, 1918

<i>Assets.</i>		<i>Liabilities.</i>	
<b>Niagara System:</b>		<b>Provincial Treasurer:</b>	
Right of Way .....	\$1,423,039 58	Cash advances <i>re</i> Niagara and other Systems, less contra accounts .....	\$20,988,944 79
Steel Tower Lines .....	4,144,401 28		
Wood Pole Lines .....	2,441,655 92		
Transformer Stations .....	4,746,542 60	Cash advances <i>re</i> Niagara Power Development Works .....	5,075,000 00
Distributing Stations .....	546,529 94		
Rural Lines .....	481,288 00		
	<u>\$13,783,457 32</u>		
<b>Thunder Bay System (formerly Port Arthur System):</b>			
Power Development .....	\$14,426 04	Central Ontario System—due thereto .....	683,177 27
Wood Pole Lines .....	24,004 64		
Transformer Station .....	88,868 32	Bank of Montreal:	
	<u>127,299 00</u>	Cash advances <i>re</i> construction of third pipe line on Ontario Power Company's property .....	1,000,000 00
<b>Severn System:</b>			
Power Development .....	\$551,528 17	Debentures issued to cover purchase of Capital Stock of Ontario Power Company of Niagara Falls....	7,990,100 00
Wood Pole Lines .....	527,295 04		
Distributing Stations .....	166,874 32		
	<u>1,245,697 53</u>	Debentures issued to cover purchase price of Essex System .....	226,000 00
<b>St. Lawrence System:</b>			
Wood Pole Lines .....	\$250,447 76	Debentures Assumed:	
Distributing Stations .....	99,715 83	Line to Brick Companies at Streets- ville .....	\$5,217 91
	<u>350,163 59</u>	Muskoka Power Development .....	46,694 29
<b>Wasdell's System:</b>			
Power Development .....	\$140,562 83		
Wood Pole Lines .....	110,470 54	Accounts payable .....	\$58,893 55
Distributing Stations .....	14,735 04	Bond Interest Coupons overdue but not presented .....	6,240 00
Rural Lines .....	4,357 48		
	<u>270,125 89</u>		
<b>Eugenia System:</b>			
Power Development .....	\$840,139 79		
Wood Pole Lines .....	518,067 75		
Distributing Stations .....	143,048 41		
Rural Lines .....	1,576 62		
	<u>1,502,832 57</u>		
<b>Ottawa System:</b>			
Meters, etc. ....	591 55	Reserves for Sinking Fund:	
		Municipalities:	
		Niagara System .....	\$328,102 88
		Niagara System—Rural Lines .....	28,067 39
		Thunder Bay System .....	14,898 16





## HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO

Detailed Statement of Assets and Liabilities—31st October, 1918—Continued

*Assets.**Inventories:*

Construction and maintenance tools and equipment .....	\$23,059 52
Construction material and sundry supplies .....	637,245 95
Maintenance material and supplies.	117,787 86

778,093 33

*Farm Equipment, Produce, etc.:*

Equipment and supplies .....	\$25,086 97
Improvements to property .....	3,349 17
Live stock and produce .....	24,266 35
Expenditures on account of 1919 crops .....	7,118 45

59,820 94

Shares of Capital Stock of Ontario Power Company of Niagara Falls .....	7,990,100 00
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*Ontario Power Company of Niagara Falls:*

Expenditures to date in connection with construction of third pipe line and extension to Port Colborne Distribution System ....	1,357,376 03
Current account .....	51,686 64

1,409,062 67

*Sinking Fund on deposit with Provincial Secretary .....*

Secretary .....	\$475,000 00
Interest accrued to date .....	40,091 20

515,091 20

*Investments:*

Debentures purchased of the Hydro-Electric Power Commission (issued in connection with the purchase of the capital stock of Ontario Power Company):	
Purchase price .....	79,844 50
Par value, \$115,000.	

*Cash:*

In bank .....	\$26,626 00
In hands of employees as advances on account of expenses .....	74,792 81

*Liabilities.**Due to Municipalities in respect of Operating Surpluses:*

Niagara System .....	\$575,404 31
Thunder Bay System .....	9,296 72
Severn System .....	47,751 63
Eugenia System .....	10,195 45

Surplus of Interest Account .....	\$642,648 11
	30,063 87

672,711 98

*Dividends received in excess of Bond Interest paid re Capital Stock of Ontario Power Co.:*

Dividends received .....	\$399,508 00
Interest paid on Bonds issued in connection with the purchase of this stock, plus exchange thereon .....	325,312 68

Surplus applicable to a Sinking Fund for the redemption of the Bonds .....	74,195 32
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74,195 32

*Surplus arising from Departmental Operation in Service Buildings:*

Storehouse surplus .....	\$106,221 13
Less Laboratory deficit for year written off..	\$15,231 93
Less Farm deficit written off .....	18,995 93

34,227 86

Machine Shop surplus .....	\$71,993 27
	8,759 58

80,752 85



## NIAGARA

Statement showing Cost of Power, Operating Expenses, Fixed Charges  
the year ending

Municipality	Rate per Horse Power Collected	Average Horse Power	Cost of Power	Operating Maintenance and Adminis- tration Expenses	Interest	Total Expenses
			\$ c.	\$ c.	\$ c.	\$ c.
Toronto .....	14.50	56,591.2	500,027 97	68,040 44	113,218 18	681,286 59
Port Credit .....	27.00	58.6	517 78	301 21	221 76	1,040 75
Weston .....	30.00	741.4	6,550 85	2,422 68	2,746 01	11,719 54
Brampton .....	22.00	819.1	7,237 40	2,566 07	2,604 32	12,407 79
Milton .....	28.00	298.1	2,633 95	1,452 51	2,030 87	6,117 33
Mimico .....	27.00	168.7	1,490 60	727 05	649 64	2,867 29
Mimico Asylum & Brick.	29.00	143.7	1,269 70	609 53	822 36	2,701 59
Etobicoke Township ..	27.00	134.4	1,187 53	621 13	517 55	2,326 21
New Toronto .....	27.00	1,880.8	16,618 35	7,045 12	8,745 43	32,408 90
Toronto Township .....	25.00	136.6	1,206 97	701 63	486 96	2,395 56
Woodbridge .....	33.83	91.4	807 59	647 74	763 31	2,218 64
Bolton .....	43.00	100.8	890 65	881 71	1,552 17	3,324 53
Dundas .....	14.00	2,094.3	18,504 80	3,653 08	2,702 80	24,863 68
Hamilton .....	14.00	12,329.1	108,937 35	19,295 40	17,238 24	145,470 99
Waterdown .....	26.00	78.4	692 72	597 25	544 52	1,834 49
Caledonia .....	24.00	57.4	507 18	379 21	263 44	1,149 83
Hagersville .....	33.21	109.5	967 52	1,022 45	1,182 45	3,172 42
Lynden .....	33.00	73.8	652 09	978 70	990 09	2,620 88
Guelph .....	20.00	2,999.1	26,499 42	11,774 63	7,142 97	45,417 02
Ontario Agric. College..	23.00	139.2	1,229 94	528 13	373 70	2,131 77
Military Hospital Com..	24.00	176.2	1,556 86	715 93	515 55	2,788 34
Acton.....	36.00	187.6	1,657 59	1,217 99	1,047 40	3,922 98
Rockwood.....	38.00	39.9	352 55	474 48	482 46	1,309 49
Georgetown.....	36.00	340.1	3,005 05	2,420 39	2,882 01	8,307 45
Elora.....	33.97	165.7	1,464 09	1,373 18	1,575 33	4,412 60
Fergus .....	33.97	113.4	1,001 98	962 72	1,135 83	3,100 53
Preston .....	19.00	975.4	8,618 43	3,574 93	2,850 58	15,043 94
Galt .....	20.00	2,529.9	22,353 67	9,699 83	8,100 49	40,153 99
Hespeler .....	21.00	331.5	2,929 07	1,451 82	1,201 03	5,581 92
Breslau .....	12 00 + K.W.H.	28.9	255 35	486 60	960 71	1,702 66
Kitchener .....	20.00	4,055.1	35,830 02	13,461 89	11,983 10	61,275 01
Waterloo .....	21.00	827.3	7,309 85	2,909 60	2,590 76	12,810 21
New Hamburg .....	32.00	171.8	1,517 99	1,223 31	1,183 24	3,924 54
Baden .....	32.00	176.4	1,558 63	1,013 79	1,036 39	3,608 81
Wellesley .....	39.96	123.6	1,092 11	898 20	1,209 17	3,199 48
Petersburg & St. Agatha.	.....	15.6	137 84	153 26	358 85	649 95
St. Jacobs .....	32.44	71.3	630 01	641 27	527 89	1,799 17
Elmira .....	38.00	152.9	1,351 00	1,135 28	1,280 40	3,766 68
Stratford .....	27.00	1,489.2	13,158 26	6,815 23	6,453 31	26,426 80
Seaforth .....	38.00	571.8	5,052 31	3,630 40	4,195 91	12,878 62
Dublin .....	47.91	26.9	237 68	432 02	368 99	1,038 69
Mitchell .....	36.00	165.2	1,459 67	1,176 33	1,083 73	3,719 73
Clinton .....	42.00	116.6	1,030 25	1,435 65	1,293 27	3,759 17
Goderich .....	43.00	323.2	2,855 73	2,995 53	4,752 38	10,603 64
Palmerston .....	40.82	84.4	745 65	1,143 87	1,078 21	2,967 73



SYSTEM

and Revenue, also the Net Surplus or Deficit for each Municipality for October 31, 1918

Revenue from Municipalities	Surplus or Deficit after paying Cost of Power, Operating, Maintenance and Interest			Fixed Charges			Net Surplus or Deficit for year		Sinking Fund Paid for Year
	Surplus	Deficit		Renewals.	Contingencies	Sinking Fund	Surplus	Deficit	
\$ c.	\$ c.	\$ c.		\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	
810,686 52	129,399 93		56,785 42	13,531 76	50,948 22	8,134 53			1918
1,581 51	540 76		126 45	14 01	95 85	304 45			1917
22,242 22	10,522 68		1,562 49	177 28	1,235 70	7,547 21			1918
19,379 96	6,972 17		1,457 81	195 86	1,171 94	4,146 56			1918
7,809 89	1,692 56		1,207 47	71 28		413 81			
4,554 87	1,687 58		371 04	40 34	281 11	995 09			1917
4,000 97	1,299 38		484 17	34 36		780 85			
3,629 68	1,303 47		295 59	32 14		975 74			
50,782 75	18,373 85		5,075 80	449 73		12,848 32			
3,414 55	1,018 99		276 02	32 67		710 30			
3,093 16	874 52		458 05	21 86		394 61			
4,333 30	1,008 77		949 20	24 10		35 47			
29,651 07	4,787 39		1,527 39	500 78	1,216 26	1,542 96			1918
174,674 57	29,203 58		9,820 99	2,948 06	7,757 21	8,677 32			1918
2,038 25	203 76		344 27	18 75	245 03		394 29		1918
1,224 40	74 57		160 21	13 72	105 04		204 40		1917
3,434 44	262 02		730 57	26 18			494 73		
2,434 57		186 31	613 10	17 65			817 06		
59,982 51	14,565 49		3,945 58	717 13	3,214 34	6,688 44			1918
3,201 78	1,070 01		209 48	33 28	168 16	659 09			1918
4,229 40	1,441 06		291 74	42 13		1,107 19			
6,377 40	2,454 42		622 17	44 86	390 52	1,396 87			1917
2,170 41	860 92		294 64	9 54		556 74			
11,562 00	3,254 55		1,742 42	81 32		1,430 81			
5,002 91	590 31		955 92	39 62			405 23		
3,852 74	752 21		690 28	27 11		34 82			
18,578 34	3,534 40		1,589 69	233 23	1,282 76	428 72			1918
54,262 93	14,108 94		4,565 04	604 94	3,645 22	5,293 74			1918
7,256 34	1,674 42		685 43	79 27	540 46	369 26			1918
1,440 09		262 57	594 76	6 91				864 24	
81,806 19	20,531 21		6,587 57	969 63	5,392 39	7,581 62			1918
17,493 77	4,683 56		1,435 24	197 82	1,165 84	1,884 66			
5,194 40	1,269 86		701 31	41 08	532 46		4 99		1918
5,016 01	1,407 20		608 50	42 18	502 11	254 41			1917
4,556 41	1,356 93		728 19	29 55		599 19			
880 38	230 40		220 81	3 73		5 86			
2,092 72	293 55		314 08	17 05			37 58		
5,616 07	1,849 39		766 24	36 56		1,046 59			
40,207 17	13,780 37		3,528 63	356 09	2,904 00	6,991 65			1918
21,729 81	8,851 19		2,428 66	136 73	1,888 16	4,397 64			1918
1,218 46	179 77		221 50	6 43			48 16		
5,946 00	2,226 27		621 34	39 50	487 68	1,077 75			1918
4,895 80	1,136 63		768 78	27 88		339 97			
13,895 42	3,291 78		2,860 70	77 28		353 80			
3,331 23	363 50		645 28	20 18			301 96		

## NIAGARA

Statement showing Cost of Power, Operating Expenses, Fixed Charges,  
the year ending

Municipality	Rate per Horse Power Collected	Average Horse Power	Cost of Power	Operating Mainten- ance and Adminis- tration Expenses	Interest	Total Expenses
			\$ c.	\$ c.	\$ c.	\$ e.
Harriston .....	46.62	77.4	683 89	1,110 71	1,534 43	3,329 03
Milverton .....	35.63	232.5	2,054 32	1,829 18	1,702 17	5,585 67
Listowel .....	37.41	205.8	1,818 40	1,981 26	1,957 82	5,757 48
Drayton .....	60.45	32.	282 75	530 79	839 65	1,653 19
Moorefield .....	63.93	16.	141 37	318 88	388 74	848 99
Tavistock .....	37.01	225.7	1,994 24	1,653 19	1,747 61	5,395 04
St. Mary's .....	28.00	373.9	3,303 71	2,857 78	2,524 38	8,685 87
Woodstock .....	21.00	1,196.8	10,574 68	4,029 46	3,171 15	17,775 29
Ingersoll .....	23.00	816.2	7,211 76	4,093 01	3,028 64	14,333 41
Tillsonburg .....	35.00	484.6	4,281 82	2,618 84	2,975 41	9,876 07
Norwich .....	38.00	183.5	1,621 37	1,173 55	1,123 76	3,918 68
Beachville .....	28.00	232.3	2,052 55	1,412 86	1,101 37	4,566 78
Embro .....	45.00	23.	203 22	905 62	665 30	1,774 14
Otterville .....	45.00	21.1	186 44	347 99	283 06	817 49
Burgessville .....	48.38	22.7	200 57	373 31	260 93	834 81
Springfield .....	65 00	24.4	215.59	318 72	427 27	961 58
London .....	21.00	8,401.8	74,236 54	22,319 73	24,910 51	121,466 78
Thamesford .....	45.00	59.5	525.73	893 92	766 87	2,186 52
Thorndale .....	45.00	83.3	736 02	1,286 51	1,123 41	3,145 94
Dorchester .....	45.00	16.6	146 67	248 55	180 49	575 71
Lucan .....	47.74	137.	1,210 50	679 31	1,023 41	2,913 22
Ailsa Craig .....	49.67	86.4	763 42	628 17	1,066 85	2,458 44
Granton .....	48.61	39.4	348 13	393 01	536 79	1,277 93
Exeter .....	41.66	140.9	1,244 96	1,028 54	1,755 88	4,029 38
Hensall .....	47.76	44.2	390 55	442 73	935 18	1,768 46
Dashwood .....	56.75	46.5	410 87	429 30	914 93	1,755 10
Zurich .....	69.34	49.	432 95	451 37	1,132 07	2,016 39
Lambeth .....	46.56	15.9	140 49	194 02	321 01	655 52
Delaware .....	46.56	7.7	68 03	101 74	155 42	325 19
Mount Brydges .....	46.56	25.	220 89	303 39	504 67	1,028 95
Strathroy .....	44.07	298.	2,633 07	1,573 30	2,899 30	7,105 67
St. Thomas .....	26.00	1,936.3	17,108 74	8,325 78	7,991 38	33,425 90
Aylmer .....	39.00	55.3	488 61	475 97	1,223 37	2,187 95
Port Stanley .....	9.00 + Fixed Cgs	113.5	1,002 87	1,102 30	1,375 19	3,480 36
London & Pt. Stanley Ry.	12.00 + .45K.W.H.	1,123.7	9,928 78	10,971 55	6,115 66	27,015 99
Dutton .....	43.53	55.	485 97	617 95	689 35	1,793 27
Rodney .....	63.00	24.8	219 13	394 58	544 74	1,158 45
West Lorne .....	55.60	25.7	227 08	352 94	417 85	997 87
Brantford .....	19.00	2,504.3	22,127 47	6,650 65	6,180 91	34,959 03
Paris .....	21.00	513.	4,532 76	1,572 95	1,326 02	7,431 73
St. George .....	38.78	42.5	375 53	403 04	518 30	1,296 87
Ayr .....	37.40	40.6	358 74	519 48	550 73	1,428 95
Drumbo .....	40.73	14.5	128 12	210 63	244 42	583 17
Princeton .....	65.95	10.5	92 78	263 95	394 92	751 65
Plattsville .....	49.27	42.	371 10	751 23	1,105 77	2,228 10

SYSTEM

and Revenue, also the Net Surplus or Deficit for each Municipality for October 31, 1918

Revenue from Municipalities	Surplus or Deficit after paying Cost of Power, Operating, Maintenance and Interest		Fixed Charges			Net Surplus or Deficit for year		Sinking Fund Paid for Year
	Surplus	Deficit	Renewals	Contingencies	Sinking Fund	Surplus	Deficit	
\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	
3,209 37		119 66	932 78	18 51			1,070 95	
7,360 52	1,774 85		985 06	55 59		734 20		
7,698 64	1,941 16		1,153 89	49 21		738 06		
1,873 19	220 00		513 94	7 65			301 59	
1,002 73	153 74		237 54	3 82			87 62	
8,353 75	2,958 71		1,015 77	53 97		1,888 97		
10,469 85	1,783 98		1,384 60	89 40	1,135 97		825 99	1918
25,132 45	7,357 16		1,755 49	286 17	1,427 01	3,888 49		1918
19,514 19	5,180 78		1,738 44	195 16	1,362 89	1,884 29		1918
16,739 62	6,863 55		1,767 94	115 87	1,338 93	3,640 81		1918
6,971 42	3,052 74		667 63	43 88	594 58	1,746 65		1917
6,504 40	1,937 62		644 40	55 55	394 75	842 92		1917
1,035 74		738 40	411 46	5.50			1,155 36	
949 47	131 98		172 92	5 04			45 98	
1,060 32	225 51		158 78	5 42		61 31		
1,492 29	530 71		262 43	5 83		262 45		
176,438 46	54,971 68		13,671 56	2,008 99	11,209 75	28,081 38		1918
2,617 10	430 58		465 86	14 22			49 50	
2,847 13		298 81	683 33	19 92			1,002 06	
744 74	169 93		109 06	3 97		56 00		
5,814 70	2,901 48		608 69	32 76		2,260 03		
4,293 41	1,834 97		647 28	20 66		1,167 03		
1,917 25	639 32		326 59	9 42		303 31		
5,545 62	1,516 24		1,065 58	33 69		416 97		
2,112 97	344 51		574 51	10 57			240 57	
2,493 22	738 12		561 34	11 12		165 66		
3,399 52	1,383 13		696 48	11 72		674 93		
739 96	84 38		197 04	3 80			116 46	
358 50	33 31		95 41	1 84			63 94	
1,162 05	133 10		309 78	5 98			182 66	
12,551 10	5,445 43		1,744 77	71 26		3,629 40		
50,593 98	17,168 08		4,458 00	463 00	3,596 12	8,650 96		1918
3,235 69	1,047 74		749 28	13 22		285 24		
4,881 71	1,401 35		827 98	27 14	642 14		95 91	1917
23,495 73		3,520 26	3,510 90	268 69			7,299 85	
2,394 47	601 20		415 61	13 15		172 44		
1,562 38	403 93		333 59	5 93		64 41		
1,429 36	431 49		254 04	6 15		171 30		
47,781 04	12,822 01		3,469 37	598 81		8,753 83		
10,786 48	3,354 75		748 12	122 67		2,483 96		
1,465 21	168 34		317 26	10 16			159 08	
1,464 51	35 56		337 82	9 71			311 97	
591 58	8 41		150 49	3 47			145 55	
694 66		56 99	245 17	2 51			304 67	
2,024 96		203 14	684 51	10 04			897 69	

## NIAGARA

Statement showing Cost of Power, Operating Expenses, Fixed Charges,  
the year ending

Municipality	Rate per Horse Power Collected	Average Horse Power	Cost of Power	Operating Mainten- ance and Adminis- tration Expenses	Interest	Total Expenses
			\$ c.	\$ c.	\$ c.	\$ c.
Waterford .....	39.00	103.	910 09	660 70	940 11	2,510 90
Burford .....	37.50	33.2	293 35	674 10	630 80	1,598 25
Simcoe .....	35.00	129.8	1,146 89	559 72	680 07	2,386 68
Chatham .....	30.78	1,205.2	10,648 90	5,918 94	8,027 90	24,595 74
Wallaceburg .....	38.45	489.	4,320 70	3,656 66	4,570 05	12,547 41
Tilbury .....	39.45	67.9	599 95	968 92	1,098 21	2,667 08
Comber .....	56.22	20.	176 71	530 66	676 28	1,383 65
Dresden .....	43.00	88.4	781 09	773 58	924 02	2,478 69
Petrolia .....	36.26	329.	2,906 97	2,571 68	3,402 16	8,880 81
Oil Springs .....	38.54	37.1	327 81	415 70	612 70	1,356 21
Brigden .....	57.56	21.9	193 50	487 82	892 72	1,574 04
Wyoming .....	38.34	25.3	223 55	322 98	533 14	1,079 67
Watford .....	59.45	47.	415 28	1,056 50	1,697 73	3,169 51
Forest .....	63.27	98.3	868 56	1,331 16	2,131 61	4,331 33
Sarnia .....	38.00	1,084.2	9,579 77	8,388 18	12,998 24	30,966 19
Blenheim .....	43.70	80.4	710 39	1,056 46	1,410 69	3,177 54
Ridgetown .....	47.17	122.3	1,080 61	1,256 64	1,600 31	3,937 56
Highgate .....	51.82	52.8	466 53	669 90	907 61	2,044 04
Thamesville .....	45.40	37.2	328 69	546 64	650 91	1,526 24
Bothwell .....	59.26	54.7	483 32	1,072 44	1,436 42	2,992 18
Windsor .....	38.00	1,699.4	15,015 54	9,253 90	18,279 30	42,548 74
Walkerville .....	38.00	2,212.	19,544 76	11,866 56	23,700 15	55,111 47
Welland Dist.....	14.00	2,945.5	26,025 82	2,068 94	2,999 02	31,093 78
Welland .....	14.00	2,567.8	22,688 54	1,766 78	2,697 67	27,152 99
Dunnville .....	27.77	36.5	322 50	1,629 56	1,250 52	3,202 58
Niagara Falls .....	11.50	2,289.2	20,226 90	524 69	840 43	21,592 02
Stamford Township ..	16.57	407.6	3,601 46	218 51	400 29	4,220 26
Total Municipalities .....		128,711.0	1,137,263 36	335,082 23	411,569 91	1,883,915 50
Total Companies ...		28,117.8	248,443 05	51,735 95	70,242 88	370,421 88
Total .....		156,828.8	1,385,706 41	386,818 18	481,812 79	2,254,337 38



SYSTEM

and Revenue, also the Net Surplus or Deficit for each Municipality for October 31, 1918

Revenue from Municipalities	Surplus or Deficit after paying Cost of Power, Operating, Maintenance and Interest		Fixed Charges			Net Surplus or Deficit for year		Sinking Fund Paid for Year
	Surplus	Deficit	Renewals	Con-tingencies	Sinking Fund	Surplus	Deficit	
\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	
3,794 68	1,283 78	.....	571 37	24 63	.....	687 78	.....	....
1,148 43	.....	449 82	389 04	7 94	.....	.....	846 80	....
4,542 98	2,156 30	.....	404 64	31 04	.....	1,720 62	.....	....
37,303 36	12,707 62	.....	4,233 70	288 18	.....	8,185 74	.....	....
18,802 06	6,254 65	.....	2,538 29	116 92	.....	3,599 44	.....	....
2,680 58	13 50	.....	642 23	16 24	.....	.....	644 97	....
1,125 78	.....	257 87	409 68	4 78	.....	.....	672 33	....
3,801 17	1,322 48	.....	520 03	21 14	.....	781 31	.....	....
11,929 59	3,048 78	.....	1,912 41	78 67	.....	1,057 70	.....	....
1,908 04	551 83	.....	358 81	8 87	.....	184 15	.....	....
1,260 89	.....	313 15	543 81	5 24	.....	.....	862 20	....
969 33	.....	110 34	316 86	6 05	.....	.....	433 25	....
2,483 51	.....	686 00	1,030 62	11 24	.....	.....	1,727 86	....
5,873 02	1,541 69	.....	1,268 34	23 50	.....	249 85	.....	....
41,198 34	10,232 15	.....	7,418 72	259 25	.....	2,554 18	.....	....
3,512 73	335 19	.....	829 40	19 22	.....	.....	513 43	....
5,769 25	1,831 69	.....	920 67	29 24	.....	881 78	.....	....
2,736 38	692 34	.....	532 92	12 63	.....	146 79	.....	....
1,690 37	164 13	.....	382 64	8 90	.....	.....	227 41	....
3,063 23	71 05	.....	862 20	13 08	.....	.....	804 23	....
64,705 21	22,156 47	.....	9,498 41	406 35	.....	12,251 71	.....	....
84,212 47	29,101 00	.....	12,305 41	528 92	.....	16,266 67	.....	....
41,237 51	10,143 73	.....	1,874 44	704 31	.....	7,564 98	.....	....
36,579 17	9,426 18	.....	1,686 04	614 00	.....	7,126 14	.....	....
1,013 59	.....	2,188 99	781 57	8 73	.....	.....	2,979 29	....
26,326 67	4,734 65	.....	525 27	547 38	.....	3,662 00	.....	....
6,424 14	2,203 88	.....	250 18	97 46	.....	1,856 24	.....	....
2,451,661 23	577,138 04	9,392 31	225,930 21	30,776 61	106,872 60	231,808 12	27,641 81	....
483,546 91	113,125 03	.....	40,649 11	6,723 39	31,609 30	34,143 23	.....	....
2,935,208 14	690,263 07	9,392 31	266,579 32	37,500 00	138,481 90	265,951 35	27,641 81	....

## NIAGARA

Statement showing "Reserve for Renewals," "Reserve for Contingencies,"  
Municipality

	Surplus or Deficit after paying Cost of Power, Operating, Maintenance and Interest		Reserve for Renewals	Reserve for Contingency
	Surplus	Deficit		
	\$ c.	\$ c.	\$ c.	\$ c.
Acton .....	4,373 51		2,845 90	84 35
Ailsa Craig .....	1,704 83		1,471 13	25 38
Aylmer .....	1,047 74		749 28	13 22
Ayr .....		471 25	1,290 12	20 01
Baden .....	6,699 20		3,858 69	91 08
Beachville .....	8,502 32		3,458 95	105 19
Blenheim .....		391 86	2,804 24	38 69
Bolton .....	236 10		3,907 16	44 47
Bothwell .....		1,042 39	2,689 34	24 01
Brampton .....	27,448 11		10,440 59	405 30
Brantford .....	24,869 85		16,888 77	1,243 35
Breslau District .....	3,165 75		2,604 34	6 91
Brigden .....		313 15	543 81	5 24
Burford .....		1,346 20	1,380 56	16 40
Burgessville .....	797 69		247 19	7 34
Caledonia .....	1,135 05		675 31	27 03
Chatham .....	11,799 40		14,862 47	486 44
Clinton .....	2,608 71		4,389 21	54 02
Comber .....		1,778 41	1,923 70	9 86
Dashwood .....	396 16		821 87	12 73
Delaware .....	172 01		308 24	3 92
Dorchester .....	836 05		407 63	7 95
Dresden .....	739 42		2,795 63	38 16
Drayton .....	220 00		513 94	7 65
Drumbo .....		273 02	728 10	7 21
Dublin .....	100 05		236 33	6 59
Dundas .....	12,218 49		5,934 74	855 71
Dunnville .....		2,188 99	781 57	8 73
Dutton .....	749 27		1,470 72	24 16
Elmira .....	4,262 75		4,085 55	67 36
Elora .....	363 95		3,018 74	68 52
Embro .....		1,723 39	1,705 25	11 96
Etobicoke .....	1,491 36		340 69	38 04
Exeter .....		4,618 71	5,330 43	58 90
Fergus .....	1,199 40		3,067 12	53 38
Forest .....	1,236 10		2,047 63	33 30
Galt .....	58,728 12		21,673 99	1,247 50
Georgetown .....	7,310 03		9,014 19	171 27
Goderich .....	1,008 44		14,048 04	135 90
Granton .....	440 00		702 85	12 58
Guelph .....	56,718 18		26,090 41	1,422 16
Hagersville .....	476 89		3,959 41	51 42
Hamilton .....	90,333 82		46,975 94	5,632 32
Harriston .....		925 71	2,287 03	35 95
Hensall .....		1,358 60	1,693 68	17 16
Hespeler .....	11,752 57		5,002 74	178 97
Highgate .....	340 45		835 20	16 69
Ingersoll .....	27,247 19		13,744 99	409 13
Kitchener .....	75,412 39		36,033 22	1,930 94
Lambeth .....	230 57		821 33	8 23

SYSTEM

“ Reserve for Sinking Fund,” and the “Net Surplus” or “Deficit” of each to October 31, 1918

Reserve for Sinking Fund	Net Surplus or Deficit		Period of Operation			Sinking Fund charged	
	Surplus	Deficit	Date commenced	Years	Months	No. of Years	To October 31
\$ c.	\$ c.	\$ c.					
390 52	1,052 74		Jan., 1913	5	10	1	1917
.....	208 32		Jan., 1916	2	10	.....	.....
.....	285 24		Mar., 1918	.....	8	.....	.....
.....		1,781 38	Jan., 1915	3	10	.....	.....
502 11	2,247 32		May, 1912	6	6	1	1917
.....							
394 75	4,543 43		Aug., 1912	6	3	1	1917
.....		3,234 79	Nov., 1915	3	.....	.....	.....
.....		3,715 53	Feb., 1915	3	9	.....	.....
.....		3,755 74	Sep., 1915	3	2	.....	.....
2,310 91	14,291 31		Nov., 1911	7	.....	2	1918
.....							
.....	6,737 73		Feb., 1914	4	9	.....	.....
1,567 09		1,012 59	Jan., 1914	4	10	.....	.....
.....		862 20	Jan., 1918	.....	10	.....	.....
.....		2,743 16	June, 1915	3	5	.....	.....
.....	543 16		Nov., 1916	2	.....	.....	.....
.....							
105 04	327 67		Oct., 1912	6	1	1	1917
.....		3,549 51	Feb., 1915	3	9	.....	.....
.....		1,834 52	Mar., 1914	4	8	.....	.....
.....		3,711 97	May, 1915	3	6	.....	.....
.....		438 44	Sep., 1917	1	2	.....	.....
.....							
.....		140 15	Mar., 1915	3	8	.....	.....
.....	420 47		Dec., 1914	3	11	.....	.....
.....		2,094 37	April, 1915	3	7	.....	.....
.....		301 59	Mar., 1918	.....	8	.....	.....
.....		1,008 33	Dec., 1914	3	11	.....	.....
.....							
.....		142 87	Oct., 1917	1	1	.....	.....
2,059 78	3,368 26		Jan., 1911	7	10	2	1918
.....		2,979 29	Jun., 1918	.....	5	.....	.....
.....		745 61	Sep., 1915	3	2	.....	.....
.....	109 84		Nov., 1913	5	.....	.....	.....
.....							
.....		2,723 31	Nov., 1914	4	.....	.....	.....
.....		3,440 60	Jan., 1915	3	10	.....	.....
.....	1,112 63		Aug., 1917	1	3	.....	.....
.....		10,008 04	June, 1916	2	5	.....	.....
.....		1,921 10	Nov., 1914	4	.....	.....	.....
.....							
.....		844 83	Mar., 1917	1	8	.....	.....
6,778 86	29,027 77		May, 1911	7	6	2	1918
.....		1,875 43	Sep., 1913	5	2	.....	.....
.....		13,175 50	Feb., 1914	4	9	.....	.....
.....		275 43	July, 1916	2	4	.....	.....
.....							
6,240 17	22,965 44		Dec., 1910	7	11	2	1918
.....		3,533 94	Sep., 1913	5	2	.....	.....
14,516 77	23,208 79		Feb., 1911	7	9	2	1918
.....		3,248 69	July, 1916	2	4	.....	.....
.....		3,069 44	Jan., 1917	1	10	.....	.....
.....							
1,083 95	5,486 91		Feb., 1911	7	9	2	1918
.....		511 44	Dec., 1916	1	11	.....	.....
2,846 68	10,246 39		May, 1911	7	6	2	1918
10,664 94	26,783 29		Jan., 1911	7	10	2	1918
.....		598 99	April, 1915	3	7	.....	.....

## NIAGARA

Statement Showing "Reserve for Renewals," "Reserve for Contingencies,"  
Municipality to

	Surplus or Deficit after paying Cost of Power, Operating, Maintenance and Interest		Reserve for Renewals	Reserve for Contingency
	Surplus	Deficit		
	\$ c.	\$ c.	\$ c.	\$ c.
Listowel .....	2,516 61		2,709 39	88 07
London .....	215,820 55		91,541 72	4,125 04
London & Port Stanley Rly. ....	1,809 17		10,867 84	550 48
Lucan .....	3,369 70		2,413 26	53 44
Lynden .....		963 65	1,769 13	39 88
Military Hospital .....	7,216 65		1,570 56	93 51
Milton .....	5,171 38		8,379 20	159 36
Milverton .....	1,862 25		1,786 10	82 17
Mimico .....	5,493 67		2,650 95	88 00
Mimico Asylum .....	6,402 49		4,050 98	75 44
Mitchell .....	8,974 99		6,685 63	78 65
Moorefield .....	153 74		237 54	3 82
Mount Brydges .....	662 12		1,136 39	12 09
New Hamburg .....	4,565 31		5,652 33	79 86
New Toronto .....	26,394 00		7,536 06	649 42
Niagara Falls .....	7,631 00		946 37	1,104 55
Norwich .....	6,327 94		4,857 00	93 73
Oil Springs .....	551 83		358 81	8 87
Ontario Agricultural College. ....	8,772 95		2,253 31	71 80
Otterville .....	320 08		305 24	8 33
Palmerston .....	98 16		1,928 57	43 68
Paris .....	6,485 64		4,075 86	214 83
Petersburg and St. Agatha Dist. ....	1,301 37		890 92	3 73
Petrolia .....	1,229 96		5,562 94	144 59
Plattsville .....		1,674 40	2,754 69	18 60
Port Credit .....	2,610 29		1,040 19	30 13
Port Stanley .....	5,619 24		5,996 77	55 96
Preston .....	32,228 55		11,765 84	540 34
Princetown .....		304 40	960 15	5 22
Ridgetown .....	2,119 36		3,048 52	52 37
Rockwood .....		137 09	1,530 07	13 62
Rodney .....	478 44		690 75	11 04
St. George .....	173 02		968 82	19 14
St. Jacobs .....	507 67		374 72	20 29
St. Mary's .....	5,081 98		12,091 48	187 78
St. Thomas .....	67,075 34		35,550 09	957 73
Sarnia .....	10,873 25		14,833 27	474 35
Seaforth .....	23,845 89		13,521 36	241 75
Simcoe .....	4,287 34		2,361 82	61 66
Springfield .....	760 31		289 94	7 23
Stamford Township .....	4,152 29		339 64	195 21
Stratford .....	55,906 93		25,403 73	729 30
Strathroy .....	11,945 55		6,344 09	126 77
Tavistock .....	3,822 12		1,593 34	68 01
Thamesford .....		207 29	1,882,66	20 70
Thamesville .....		229 60	1,645 16	19 39
Thorndale .....		1,174 18	2,774 84	36 12
Tilbury .....		1,691 61	2,916 09	31 73



SYSTEM—Continued

“Reserve for Sinking Fund,” and the “Net Surplus” or “Deficit” of each  
October 31, 1918—Continued

Reserve for Sinking Fund	Net Surplus or Deficit		Period of Operation			Sinking Fund Charged	
	Surplus	Deficit	Date commenced	Years	Months	No. of Years	To October 31
\$ c.	\$ c.	\$ c.					
23,253 49	96,900 30	280 85	June, 1916	2	5		
			Jan., 1911	7	10	2	1918
		9,609 15	Aug., 1914	4	3		
	903 00		Feb., 1915	3	9		
		2,772 66	Nov., 1915	3			
	5,552 58		Sep., 1913	5	2		
		3,367 18	April, 1913	5	7		
		6 02	June, 1916	2	5		
281 11	2,473 61		May, 1912	6	6	1	1917
	2,276 07		Sept., 1913	5	2		
1,035 40	1,175 31		Sept., 1911	7	2	2	1918
		87 62	Mar., 1918		8		
		486 36	Mar., 1915	3	8		
1,063,96		2,230 84	Mar., 1911	7	8	2	1918
	18,208 52		Feb., 1914	4	9		
	5,580 08		Dec., 1915	2	11		
594 58	782 63		May, 1912	6	6	1	1917
	184 15		Feb., 1918		9		
355 69	6,092 15		Nov., 1911	7		2	1918
	6 51		Feb., 1916	2	9		
		1,874 09	July, 1916	2	4		
	2,194 95		Feb., 1914	4	9		
301 61	105 11		Sept., 1913	5	2		
		4,477 57	May, 1916	2	6		
		4,447 69	Dec., 1914	3	11		
95 85	1,444 12		Aug., 1912	6	3	1	1917
642 14		1,075 63	Apr., 1912	6	7	1	1917
2,621 70	17,300 67		Jan., 1911	7	10	2	1918
		1,269 77	Jan., 1915	3	10		
		981 53	Dec., 1915	2	11		
		1,680 78	Sept., 1913	5	2		
		223 35	Feb., 1917	1	9		
		814 94	Sept., 1915	3	2		
	112 66		Sept., 1917	1	2		
2,286 88		9,484 16	May, 1911	7	6	2	1918
7,368 89	23,198 63		April, 1912	6	7	2	1918
		4,434 37	Dec., 1916	1	11		
3,593 00	6,489 78		Nov., 1911	7		2	1918
	1,863 86		April, 1915	3	7		
	463 14		Aug., 1917	1	3		
	3,617 44		Nov., 1916	2			
6,360 74	23,413 16		Jan., 1911	7	10	2	1918
	5,474 69		Dec., 1914	3	11		
	2,160 77		Nov., 1916	2			
		2,110 65	Feb., 1914	4	9		
		1,894 15	Oct., 1915	3	1		
		3,985 14	Mar., 1914	4	8		
		4,639 43	Apr., 1915	3	7		

## NIAGARA

Statement showing "Reserve for Renewals," "Reserve for Contingencies,"  
Municipality to

	Surplus or Deficit after paying Cost of Power, Operating, Maintenance and Interest		Reserve for Renewals	Reserve for Contingency
	Surplus	Deficit		
	\$ c.	\$ c.	\$ c.	\$ c.
Tillsonburg .....	10,498 09	.....	11,542 09	187 25
Toronto .....	469,240 14	.....	229,033 22	25,615 78
Toronto Township .....	2,425 40	.....	1,497 44	59 36
Walkerville .....	49,699 97	.....	51,688 28	1,098 16
Wallaceburg .....	4,974 18	.....	9,893 61	199 20
Waterdown .....	1,644 81	.....	1,998 23	34 35
Waterford .....	3,165 13	.....	1,534 22	49 40
Waterloo .....	20,986 07	.....	10,144 87	412 05
Watford .....	.....	872 94	1,223 44	12 93
Welland .....	9,698 99	.....	1,954 18	680 08
Welland District .....	27,456 61	.....	4,696 10	1,564 95
Wellesley .....	1,846 94	.....	1,265 58	48 89
West Lorne .....	547 99	.....	472 55	11 42
Weston .....	19,874 64	.....	8,595 44	318 71
Windsor .....	32,526 43	.....	50,865 85	837 84
Woodbridge .....	1,608 53	.....	1,705 02	42 09
Woodstock .....	37,098 09	.....	16,282 39	599 99
Wyoming .....	.....	658 10	744 35	12 77
Zurich .....	1,103 19	.....	972 62	12 54
Total .....	1,697,386 25	24,344 94	1,020,461 57	58,878 32
Interest Improvement .....	.....	.....	94,741 29	1,015 91
Totals—Municipalities .....	1,697,386 25	24,344 94	1,115,202 86	59,894 23
Reserves against equipment employed in respect of Contracts with Sundry Customers .....	.....	.....	156,108 51	15,981 00
Interest .....	.....	.....	14,066 73	367 95
Net Profits from Contracts with Sundry Companies for years 1916-17 and 1917-18 .....	.....	.....	.....	95,616 33
Interest .....	.....	.....	.....	2,458 93
Profit on Sales of Aluminum Cable. Applied to "Reserve for Contingencies" Interest .....	.....	.....	.....	10,349 72
Totals .....	.....	.....	1,285,378 10	185,082 15
Deduct Cost of Renewals to date .....	\$102,890 23	.....	.....	.....
Items reversed with sale of certain equipment.. ..	5,795 17	.....	108,685 40	.....
Losses on Sundry Equipment sold and otherwise disposed of .....	.....	.....	.....	137,844 62
Grand Totals .....	.....	.....	1,176,692 70	47,237 53

SYSTEM—Concluded

‘Reserve for Sinking Fund,’ and the “Net Surplus” or “Deficit” of each  
October 31, 1918—Concluded

Reserve for Sinking Fund	Net Surplus or Deficit		Period of Operation			Sinking Fund Charged	
	Surplus	Deficit	Date Commene'd	Years	Months	No. of Years	To October 31
\$ c.	\$ c.	\$ c.					
2,435 00		3,666 25	Aug., 1911	7	3	2	1918
85,465 68	129,125 46		June, 1911	7	5	2	1918
	868 60		Aug., 1913	5	3		
		3,086 47	Nov., 1914	4			
		5,118 63	Feb., 1915	3	9		
475 91		863 68	Nov., 1911	7		2	1918
	1,581 51		Apr., 1915	3	7		
2,415 83	8,013 32		Dec., 1910	7	11	2	1918
		2,109 31	Sept., 1917	1	2		
	7,064 73		Sept., 1917	1	2		
	21,195 56		Dec., 1914	3	11		
	532 47		Nov., 1916	2			
	64 02		Jan., 1917	1	10		
2,274 20	8,686 29		Aug., 1911	7	3	2	1918
		19,177 26	Oct., 1914	4	1		
		138 58	Dec., 1914	3	11		
3,001 99	17,213 72		Jan., 1911	7	10	2	1918
		1,415 22	Nov., 1916	2			
	118 03		Sep., 1917	1	2		
195,385 22	575,404 31	177,088 11	Net Surplus—398,316 20				
195,385 22	575,404 31	177,088 11	Net Surplus—398,316 20				
132,717 66							
328,102 88	575,404 31	177,088 11	Net Surplus—398,316 20				
328,102 88	575,404 31	177,088 11	Net Surplus—398,316 20				

## NIAGARA

Statement showing Cost of Power, Operating Expenses, Fixed Charges  
the year ending

Municipality	Cost of Power	Operating, Maintenance and Adminis- tration Expenses	Interest	Total Expenses
Niagara System:	\$ c.	\$ c.	\$ c.	\$ c.
Bolton .....			88 24	88 24
Bothwell .....			192 06	192 06
Brampton .....			63 78	63 78
Chatham .....			44 90	44 90
Dereham Township .....			1,222 61	1,222 61
Dundas .....			947 20	947 20
Elora .....			38 90	38 90
Etobicoke .....			2,918 25	2,918 25
Georgetown .....			444 48	444 48
Goderich .....			115 66	115 66
Milton .....			39 85	39 85
Norwich .....			1,746 14	1,746 14
Preston .....			457 76	457 76
Mimico .....			8 69	8 69
St. Thomas .....			96 20	96 20
Scarboro Township .....	169 80		556 32	726 12
South Dorchester Township .....			145 01	145 01
Stratford .....			202 92	202 92
Toronto .....			1,998 97	1,998 97
Toronto Township .....			2,117 73	2,117 73
Vaughan Township .....			715 01	715 01
Walkerville .....			1,819 58	1,819 58
Waterdown .....			591 26	591 26
Waterford .....			186 33	186 33
Waterloo .....			230 48	230 48
Weston .....			250 67	250 67
Woodbridge .....			16 93	16 93
Windsor .....			422 58	422 58
Woodstock .....			54 42	54 42
Port Dalhousie .....			161 65	161 65
Welland .....	4,391 98		2,248 45	6,640 43
St. Catharines .....	68,500 10	50	300 00	68,800 60
Grantham Township .....	405 77	40 94	1,473 90	1,920 61
Lines Operated by the Hydro-Electric Power Commission of Ontario:				
Don Mills Road .....	312 37	179 93	377 86	870 16
Brady & Raymond .....		2 38	32 67	35 05
Wm. Pullen .....		3 70	2 96	6 66
Innes, Karn & Longworth .....		59 98	114 73	174 71
W. G. Bailey .....			23 97	23 97
Port Dalhousie .....	1,345 52	49 23	235 52	1,630 27
	75,125 54	336 66	22,704 64	98,166 84



## RURAL LINES

and Revenue, also the Net Surplus or Deficit for each Municipality for October 31, 1918

Revenue from Muni- cipalities	Surplus or Deficit after Paying Cost of Power, Operating, Maintenance and Interest		Fixed Charges		Net Surplus or Deficit for Year	
	Surplus	Deficit	Renewals	Sinking Fund	Surplus	Deficit
\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	\$ c.
120 00	31 76	.....	.....	31 76	.....	.....
672 05	479 99	.....	.....	479 99	.....	.....
86 74	22 96	.....	.....	22 96	.....	.....
61 06	16 16	.....	.....	16 16	.....	.....
1,662 71	440 10	.....	.....	440 10	.....	.....
1,288 20	341 00	.....	.....	341 00	.....	.....
52 90	14 00	.....	.....	14 00	.....	.....
3,837 56	919 31	.....	.....	919 31	.....	.....
604 48	160 00	.....	.....	160 00	.....	.....
157 30	41 64	.....	.....	41 64	.....	.....
54 19	14 34	.....	.....	14 34	.....	.....
2,374 76	628 62	.....	.....	628 62	.....	.....
622 56	164 80	.....	.....	164 80	.....	.....
11 82	3 13	.....	.....	3 13	.....	.....
130 84	34 64	.....	.....	34 64	.....	.....
987 39	261 27	.....	.....	171 88	89 39	.....
197 21	52 20	.....	.....	52 20	.....	.....
275 96	73 04	.....	.....	73 04	.....	.....
2,734 09	735 12	.....	.....	735 12	.....	.....
2,880 12	762 39	.....	.....	762 39	.....	.....
947 23	232 22	.....	.....	232 22	.....	.....
2,474 64	655 06	.....	.....	655 06	.....	.....
804 12	212 86	.....	.....	212 86	.....	.....
253 41	67 08	.....	.....	67 08	.....	.....
321 62	91 14	.....	.....	91 14	.....	.....
363 48	112 81	.....	.....	112 81	.....	.....
23 03	6 10	.....	.....	6 10	.....	.....
574 70	152 12	.....	.....	152 12	.....	.....
74 00	19 58	.....	.....	19 58	.....	.....
219 84	58 19	.....	.....	58 19	.....	.....
7,439 00	798 57	.....	.....	798 57	.....	.....
68,935 60	135 00	.....	.....	135 00	.....	.....
2,419 73	499 12	.....	.....	530 60	.....	31 48
848 73	.....	21 43	377 86	179 21	.....	578 50
113 16	78 11	.....	32 67	14 70	30 74	.....
96 00	89 34	.....	2 96	1 33	85 05	.....
399 35	224 64	.....	114 73	51 63	58 28	.....
72 30	48 33	.....	23 97	10 79	13 57	.....
2,012 85	382 58	.....	235 52	105 99	41 07	.....
107,204 73	9,059 32	21 43	787 71	8,542 06	318 10	609 98

## RURAL

## Statement showing "Reserve for Renewals," "Reserve for

	Date Commenced Operating	Surplus or Deficit after Paying Cost of Power, Operating, Maintenance and Interest	
		Surplus	Deficit
Lines Operated by:		\$ c.	\$ c.
Baden .....	Dec., 1913	180 01	.....
Bolton .....	Jan., 1915	89 93	.....
Bothwell .....	Nov., 1916	667 21	.....
Brampton .....	Oct., 1917	22 96	.....
Chatham .....	Jan., 1916	47 13	.....
Dereham Township .....	July, 1917	440 10	.....
Dundas .....	Oct., 1913	1,837 35	.....
Elora .....	Nov., 1914	59 35	.....
Etobicoke Township .....	Aug., 1916	919 31	.....
Georgetown .....	Dec., 1914	666 60	.....
Goderich .....	May, 1914	195 71	.....
London Abattoir .....	Jan., 1914	65 91	.....
Milton .....	Apr., 1914	62 88	.....
Mimico .....	Dec., 1913	1,008 89	.....
New Toronto (no capital investment Oct., 1918)	Dec., 1914	182 15	.....
N. Norwich Township .....	.....	157 56	.....
Norwich .....	Nov., 1913	2,068 77	.....
Preston .....	Apr., 1913	995 14	.....
St. Thomas .....	Nov., 1914	147 01	.....
Scarboro Township .....	Aug., 1918	261 27	.....
South Dorchester Township .....	July, 1917	52 20	.....
Stratford .....	Dec., 1913	387 95	.....
Thamesford (no capital investment Oct., 1918)	Jan., 1915	6 96	.....
Thorndale (no capital investment Oct., 1918)	Aug., 1914	5 98	.....
Toronto .....	Jan., 1913	3,149 39	.....
Toronto Township .....	May, 1913	3,123 60	.....
Vaughan Township .....	Sep., 1915	.....	.....
(Operated by Woodbridge until Mar. 31, 1918)	.....	232 22	.....
Walkerville .....	Feb., 1915	2,038 09	.....
Waterdown .....	Apr., 1914	931 53	.....
Waterford .....	Dec., 1915	86 28	.....
Waterloo .....	Aug., 1914	251 48	.....
Weston .....	Apr., 1914	653 25	.....
Windsor .....	Aug., 1916	349 89	.....
Woodbridge (no capital investment Oct., 1918)	Sep., 1915	39 37	.....
Woodstock .....	Nov., 1913	91 61	.....
Welland .....	Mar., 1913	2,639 40	.....
St. Catharines .....	Apr., 1914	576 10	.....
Grantham Township .....	May, 1915	1,742 56	.....
Port Dalhousie .....	Sep., 1917	58 19	.....
Hydro-Electric Power Commission of Ontario:			
Port Dalhousie .....	Nov., 1912	1,933 15	.....
Don Mills Road .....	Nov., 1914	.....	555 88
Brady & Raymond .....	Oct., 1914	466 80	.....
Wm. Pullen .....	May, 1914	459 89	.....
Innes, Karn & Longworth .....	Feb., 1913	1,324 52	.....
W. G. Bailey .....	Oct., 1914	197 55	.....
Markdale .....	Nov., 1916	33 36	.....
Flesherton .....	Feb., 1918	6 92	.....
Beaverton .....	June, 1918	29 03	.....
Ottawa .....	Mar., 1914	31 96	.....
Deduct Cost of Renewals to Date .....		30,974 38	555 88
Less Total Net Surpluses .....		.....	.....
Total .....		.....	.....



## SEVERN

Statement showing Cost of Power, Operating Expenses, Fixed Charges  
for the year ending

Municipality	Rate per Horse Power Collected	Average Horse Power	Cost of Power	Operating, Maintenance and Adminis- tration Expenses	Interest	Total Expenses	Revenue from Muni- cipalities
	\$ c.		\$ c.	\$ c.	\$ c.	\$ c.	\$ c.
Midland .....	19 00	1,345.4	9,939 69	5,870 92	6,317 42	22,128 03	25,198 51
Penetang .....	22 00	461.2	3,407 30	2,942 65	3,130 11	9,480 06	9,816 34
Collingwood .....	30 00	1,831.5	13,530 90	14,830 90	11,062 88	39,424 68	54,923 25
Barrie .....	31 00	482.8	3,566 87	3,461 62	3,061 46	10,089 95	14,966 77
Alliston .....	40 00	30.8	227 55	396 71	1,126 84	1,751 10	1,229 01
Cookstown .....	35 00	21.4	158 10	246 14	527 67	931 91	706 42
Beeton .....	45 00	26.6	152 19	331 55	828 99	1,312 73	877 12
Tottenham .....	51 00	2.6	19 21	55 06	141 82	216 09	133 02
Bradford .....	47 00	2.1	15 51	47 30	166 92	229 73	100 66
Coldwater .....	28 00	37.2	274 83	479 36	454 14	1,208 33	1,042 29
Elmvale .....	31 00	135.1	998 15	1,117 28	787 93	2,903 36	3,956 61
Stayner .....	35 00	86.7	640 50	1,019 69	712 92	2,373 11	2,867 34
Creemore .....	54 13	42.0	310 29	831 86	799 18	1,941 33	2,147 13
Waubashene .....	25 00	20.2	149 24	248 18	184 68	582 10	506 02
Pt. McNicoll .....	25 00	21.0	155 15	543 91	234 35	933 41	525 18
Victoria Harbour ....	35 00	27.7	204 65	449 88	350 99	1,005 52	970 94
Total—Municipalities. ....			33,750 13	32,873 01	29,888 30	96,511 44	119,966 61
Total—Companies....			9,916 74	5,734 87	5,858 13	21,509 74	38,852 73



SYSTEM

and Revenue; also the Net Surplus or Deficit for each Municipality  
October 31st, 1918

Profits from Sale of Power to Com- panies	Total Revenue	Surplus or Deficit after paying cost of Power, Operating, Maintenance and Interest		Fixed Charges			Net Surplus or Deficit for Year		Sink- ing Fund Paid for Year
		Surplus	Deficit	Renewals	Contin- gencies	Sinking Fund	Surplus	Deficit	
\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	
1,646 14	26,844 65	4,716 62	.....	4,343 23	336 35	.....	37 04	.....	1918
1,034 43	10,850 77	1,370 71	.....	2,151 95	115 30	1,408 55	.....	2,305 09	..
4,977 18	59,900 43	20,475 75	.....	7,605 73	457 88	.....	12,412 14	.....	..
1,231 16	16,197 93	6,107 98	.....	2,104 75	120 70	.....	3,882 53	.....	..
181 38	1,410 39	.....	340 71	774 70	7 70	.....	.....	1,123 11	..
106 28	812 70	.....	119 21	362 77	5 35	.....	.....	487 33	..
154 99	1,032 11	.....	280 62	569 93	5 15	.....	.....	855 70	..
22 18	155 20	.....	60 89	97 50	65	.....	.....	159 04	..
16 15	116 81	.....	112 92	114 76	52	.....	.....	228 20	..
144 90	1,187 19	.....	21 14	312 22	9 30	.....	.....	342 66	..
283 69	4,240 30	1,336 94	.....	541 70	33 78	.....	761 46	.....	..
283 19	3,150 53	777 42	.....	490 13	21 68	.....	265 61	.....	..
267 47	2,414 60	473 27	.....	549 43	10 50	.....	.....	86 66	..
48 66	554 68	.....	27 42	126 97	5 05	.....	.....	159 44	..
125 92	651 10	.....	282 31	161 12	5 25	.....	.....	448 68	..
106 35	1,077 29	71 77	.....	241 32	6 93	.....	.....	176 48	..
10,630 07	130,596 68	35,330 46	1,245 22	20,548 21	1,142 09	1,408 55	17,358 78	6,372 39	
Dr. 10,630 07	28,222 66	.....	.....	4,027 46	335 58	2,349 88	.....	.....	

## SEVERN

Statement Showing "Reserve for Renewals," "Reserve for Contingencies,"  
Municipality to

	Surplus or Deficit after paying Cost of Power, Operating, Maintenance and Interest		Reserve for Renewals
	Surplus	Deficit	
	\$ c.	\$ c.	\$ c.
Alliston .....		340 71	774 70
Barrie .....	27,314 35		15,401 95
Beeton .....		280 62	569 93
Bradford .....		112 92	114 76
Coldwater .....	160 72		1,969 17
Collingwood .....	55,274 00		29,573 13
Cookstown .....		119 21	362 77
Creemore .....	5,530 67		2,855 76
Elmvale .....	3,012 83		2,302 16
Midland .....	11,853 52		15,340 05
Penetang .....	20,980 73		11,841 51
Port McNicoll .....		717 46	702 16
Stayner .....	3,799 96		3,170 05
Tottenham .....		60 89	97 50
Victoria Harbour .....	2,083 85		1,372 60
Waubauskene .....	810 02		569 51
Total Municipalities .....	130,820 65	1,631 81	87,017 71
Interest .....			7,031 61
Reserves against equipment employed in respect of contracts with Sundry Companies .....			12,706 79
Interest .....			442 17
Profits on Sales of Sundry Equipment, Applied to "Reserve for Contingen- cies" .....			
Interest .....			
Total .....			107,198 28
Items reversed with sale of Sundry Equipment .....	2,905 28		
Interest .....	114 59		
Cost of Renewals to date ...	671 87		
Losses on Sundry Equipment sold and otherwise disposed of .....			3,691 74
Grand Total .....			103,506 54

SYSTEM

“Reserve for Sinking Fund” and the “Net Surplus” or “Deficit” of each October 31, 1918

Reserve for Contingencies	Reserve for Sinking Fund	Net Surplus or Deficit		Period of Operation		
		Surplus	Deficit	Date commenced	Years	Months
\$ c.	\$ c.	\$ c.	\$ c.			
7 70	.....	.....	1,123 11	June, 1918....	.....	5
232 17	.....	11,680 23	.....	April, 1915....	5	7
5 15	.....	.....	855 70	Aug., 1918....	.....	3
52	.....	.....	228 20	Oct., 1918....	.....	1
18 05	.....	.....	1,826 50	Mar., 1913....	5	8
792 93	.....	24,907 94	.....	Mar., 1913....	5	8
5 35	.....	.....	487 33	May, 1918....	.....	6
21 37	.....	2,653 54	.....	Nov., 1914....	4	.....
47 88	.....	662 79	.....	June, 1913....	5	5
570 43	.....	.....	4,056 96	July, 1911....	7	4
241 45	2,573 90	6,323 87	.....	July, 1911....	7	4*
10 58	.....	.....	1,430 20	Jan., 1915....	3	10
34 43	.....	595 48	.....	Oct., 1913....	5	1
65	.....	.....	159 04	Oct., 1918....	.....	1
13 91	.....	697 34	.....	July, 1914....	4	4
10 07	.....	230 44	.....	Dec., 1914....	3	11
2,012 64	2,573 90	47,751 63	10,167 04			
34 83	.....	.....	.....			
1,129 91	6,372 80	.....	.....			
31 78	.....	.....	.....			
6,063 33	.....	.....	.....			
193 79	.....	.....	.....			
9,466 28	8,946 70	.....	.....			
.....	.....	.....	.....			
1,326 71	.....	.....	.....			
8,139 57	8,946 70	47,751 63	10,167 04	Net Surplus—\$37,584 59		

\* 2 Years Sinking Fund, 1916-17, 1917-18.

WASDELL'S

Statement showing Cost of Power, Operating Expenses, Fixed Charges  
for the year ending

Municipality	Rate per Horse Power Collected	Average Horse Power	Operating, Maintenance, and Adminis- tration Expenses	Interest	Total Expenses	Revenue from Muni- cipalities
	\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	\$ c.
Beaverton.....	41 21	63.7	1,266 47	1,296 67	2,563 14	2,624 72
Brechin .....	50 00	38.3	936 83	1,223 91	2,160 74	1,909 79
Cannington.....	45 79	58.7	1,088 76	1,400 43	2,489 19	2,688 99
Sunderland.....	50 00	37.5	854 80	1,270 10	2,124 90	1,876 82
Woodville. ....	50 00	36.4	722 62	1,134 04	1,856 66	1,880 95
Total—Municipalities .....		234.6	4,869 48	6,325 15	11,194 63	10,981 27
Total—Severn System	25 00	362.8	4,148 63	4,305 58	8,454 21	9,125 42

RURAL LINES

Statement of Interest and Sinking Fund

	Interest	Sinking Fund	Total Expense	Revenue	Surplus or Deficit
Beaverton.....	\$100 00	\$29 03	\$129 03	\$129 03	Nil.



SYSTEM

and Revenue; also the Net Surplus or Deficit for each Municipality  
October 31st, 1918

Losses from Sales of Power to Severn System	Total Revenue	Surplus or Deficit after paying cost of Power, Operating, Maintenance and Interest		Fixed Charges		Net Surplus or Deficit for Year	
		Surplus	Deficit	Renewals	Contin- gencies	Surplus	Deficit
\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	\$ c.
704 57	1,920 15	.....	642 99	1,134 59	15 93	.....	1,793 51
710 46	1,199 33	.....	961 41	1,070 92	9 57	.....	2,041 90
586 90	2,102 09	.....	387 10	1,225 37	14 68	.....	1,627 15
662 46	1,214 36	.....	910 54	1,111 34	9 37	.....	2,031 25
522 49	1,358 46	.....	498 20	992 28	9 10	.....	1,499 58
Dr. 3,186 88	7,794 39	.....	3,400 24	5,534 50	58 65	.....	8,993 39
Cr. 3,186 88	12,312 30	3,858 09	.....	3,767 39	90 70	.....	.....

## WASDELL'S

Statement Showing "Reserve for Renewals," "Reserve for Contingencies,"  
each Municipality

	Surplus or Deficit after paying cost of Power, Operating Maintenance and Interest		Reserve for Renewals
	Surplus	Deficit	
	\$ c.	\$ c.	\$ c.
Beaverton .....		2,218 61	6,242 15
Brechin .....		1,410 19	4,271 85
Cannington .....		1,433 54	6,492 79
Sunderland .....		1,778 91	4,767 76
Woodville .....		1,315 71	5,289 35
Total Municipalities .....		8,156 96	27,063 90
Interest .....			1,885 85
Severn System....			8,107 57
Interest .....			173 61
Profit on sale of Aluminum Cable, applied to "Reserve for Contingencies" .....			
Interest .....			
Total.....			37,230 93
Deduct :—			
Items reversed with sale of certain equipment ..... \$265 10			
Cost of renewals to date ..... 243 27			
			508 37
Grand total .....			36,722 56

SYSTEM

“Reserve for Sinking Fund,” and the “Net Surplus” or “Deficit” of  
to October 31, 1918

Reserve for Contingencies	Reserve for Sinking Fund	Net Surplus or Deficit		Period of Operation		
		Surplus	Deficit	Date Commenced	Years	Months
\$ c.	\$ c.	\$ c.	\$ c.			
29 45	.....	.....	8,490 21	Nov. 1914	4	.....
17 42	.....	.....	5,699 46	Jan. 1915	2	10
28 25	.....	.....	7,954 58	Nov. 1914	4	.....
18 27	.....	.....	6,564 94	Nov. 1914	4	.....
18 52	.....	.....	6,623 58	Nov. 1914	4	.....
111 91	.....	.....	35,332 77			
2 12	.....	.....	.....			
271 15	.....	.....	.....			
7 22	.....	.....	.....			
12,614 70	.....	.....	.....			
504 58	.....	.....	.....			
13,511 68	.....	.....	.....			
13,511 68	.....	.....	.....	Net deficit, \$35,332 77		

## EUGENIA

Statement showing Cost of Power, Operating Expenses, Fixed Charges,  
for the year ending

Municipality.	Rate per Horse Power Collected	Average Horse Power	Operating Mainten- ance and Adminis- tration Expenses	Interest	Total Expenses	Revenue from Muni- cipalities
			\$ c.	\$ c.	\$ c.	\$ c.
Markdale .....	23.24	67.	536 41	663 87	1,200 28	1,509 42
Flesherton .....	25.96	33.3	414 87	480 76	895 63	864 88
Chatsworth .....	30.18	31.1	525 52	414 54	940 06	937 32
Tara .....	37.00	24.9	668 10	1,260 75	1,928 85	870 72
Owen Sound .....	31 00	1,007.6	6,205 01	10,761 58	16,966 59	31,236 01
Durham .....	33.97	69.8	996 12	790 28	1,786 40	2,372 51
Holstein .....	43.50	6.4	261 64	455 23	716 87	278 40
Mount Forest .....	34.51	119.1	1,768 35	2,632 51	4,400 86	3,883 78
Hanover .....	35.00	278.3	3,067 51	3,579 30	6,646 81	9,529 91
Elmwood .....	35.00	27.5	499 84	503 99	1,003 83	911 76
Chesley .....	40.00	95.5	1,309 43	2,269 58	3,579 01	3,818 02
Dundalk .....	27.30	83.	1,015 02	860 72	1,875 74	2,165 76
Shelburne .....	30.00	123.7	1,530 11	1,633 57	3,163 68	3,504 75
Horning's Mills .....			550 96	113 56	664 52	499 26
Orangeville .....	35.00	127.	1,487 30	1,854 94	3,342 24	4,298 88
Alton (Foundry Co.) .....	43.23	90.9	1,050 72	1,731 88	2,782 60	3,712 72
Grand Valley .....	45.00	51.5	907 76	1,004 38	1,912 14	2,219 98
Arthur .....	45.00	102.	2,028 03	2,610 48	4,638 51	4,334 23
Carlsruhe and Neustadt. ....		8.5	90 40	515 76	606 16	906 29
Total Municipalities .....		2,347.1	24,913 10	34,137 68	59,050 78	77,854 60
Total—Companies and Severn System .....		1,744.3	9,686 14	16,655 54	26,341 68	48,386 67

## RURAL LINES

Statement of Interest and Sinking Fund

—	Interest	Sinking Fund	Total Expenses	Revenue	Surplus or Deficit
		\$ c.	\$ c.	\$ c.	
Flesherton.....	23.82	6.92	30 74	30 74	Nil
Markdale .....	64.07	22.13	86 20	86 20	Nil
Total.....	87.89	29 05	116 94	116 94	.....



SYSTEM

and Revenue, also the Net Surplus or Deficit for each Municipality  
October 31, 1918

Profit from Sales of Power to Severn System	Total Revenue	Surplus or Deficit after paying Cost of Power, Operating, Maintenance and Interest		Fixed Charges		Net Surplus or Deficit for year	
		Surplus	Deficit	Renewals	Contin- gencies	Surplus	Deficit
\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	\$ c.	\$ c.
141 04	1,650 46	450 18	.....	312 32	16 75	121 11	.....
149 05	1,013 93	118 30	.....	258 90	8 33	.....	148 93
185 31	1,122 63	182 57	.....	218 11	7 78	.....	43 32
209 20	1,079 92	.....	848 93	813 22	6 23	.....	1,668 38
2,262 70	33,498 71	16,532 12	.....	5,231 56	251 90	11,048 66	.....
328 71	2,701 22	914 82	.....	393 20	17 45	504 17	.....
105 12	383 52	.....	333 35	299 21	1 60	.....	634 16
738 34	4,622 12	221 26	.....	1,553 70	29 77	.....	1,362 21
1,213 96	10,743 87	4,097 06	.....	1,862 24	69 57	2,165 25	.....
147 04	1,058 80	54 97	.....	287 35	6 88	.....	239 26
512 39	4,330 41	751 40	.....	1,354 95	23 87	.....	627 42
378 92	2,544 68	668 94	.....	413 24	20 75	234 95	.....
594 58	4,099 33	935 65	.....	857 04	30 92	47 69	.....
56 38	555 64	.....	108 88	78 07	.....	.....	186 95
547 24	4,846 12	1,503 88	.....	1,002 13	31 75	470 00	.....
464 40	4,177 12	1,394 52	.....	995 17	22 73	376 62	.....
375 12	2,595 10	682 96	.....	579 75	12 87	90 34	.....
851 15	5,185 38	546 87	.....	1,575 33	25 50	.....	1,053 96
38 30	944 59	338 43	.....	336 30	2 13	.....	.....
9,298 95	87,153 55	29,393 93	1,291 16	18,421 79	586 78	15,058 79	5,964 59
Dr. 9,298 95	39,087 72	12,747 04	.....	7,699 26	436 07	4,610 71 (Applied on Reserve for Contingencies	

## EUGENIA

Statement Showing "Reserve for Renewals," "Reserve for Contingencies,"  
Municipality to

	Surplus or Deficit after paying Cost of Power, Operating, Maintenance and Interest		Reserve for Renewals
	Surplus	Deficit	
	\$ c.	\$ c.	\$ c.
Alton Foundry .....	1,750 58	.....	2,066 82
Arthur .....	.....	712 76	2,426 79
Carlsruhe and Neustadt .....	338 43	.....	336 30
Chatsworth .....	.....	150 58	676 14
Chesley .....	.....	1,527 36	3,923 38
Dundalk .....	.....	493 27	1,642 02
Durham .....	.....	393 15	1,782 80
Elmwood .....	54 97	.....	287 35
Flesherton .....	.....	338 96	839 62
Grand Valley .....	557 81	.....	1,015 95
Hanover .....	4,129 51	.....	3,286 49
Holstein .....	.....	1,135 78	786 44
Hornings Mills .....	462 03	.....	102 99
Markdale .....	.....	126 24	1,014 94
Mount Forest .....	.....	4,597 47	5,980 30
Orangeville .....	796 18	.....	2,666 06
Owen Sound .....	27,408 71	.....	17,821 94
Shelburne .....	60 23	.....	1,865 87
Tara .....	.....	848 93	813 22
Total Municipalities .....	35,558 45	10,324 50	49,335 42
Interest .....	.....	.....	1,839 26
Reserves against equipment employed in respect of contracts with sundry Companies .....	.....	.....	14,400 06
Interest .....	.....	.....	268 03
Additional "Reserve for Renewals" provided on Second Hand Equip- ment purchased .....	.....	.....	4,084 02
Profits on Sales of Sundry Equipment applied to "Reserve for Contingen- cies" .....	.....	.....	.....
Interest .....	.....	.....	163 51
Net Profits from Contracts with Com- panies .....	.....	.....	.....
Total .....	.....	.....	70,090 30
Cost of Renewals to date .....	.....	.....	756 15
Losses on sundry equipment sold and otherwise disposed of .....	.....	.....	.....
Grand Total .....	.....	.....	69,334 15

SYSTEM

“Reserve for Sinking Fund,” and the “Net Surplus” or “Deficit” of each October 31, 1918

Reserve for Contingency	Reserve for Sinking Fund	Net Surplus or Deficit		Period of Operation		
		Surplus	Deficit	Date Commenced	Years	Months
\$ c.	\$ c.	\$ c.	\$ c.			
43 13	.....	.....	359 37	Dec., 1916....	1	11
32 22	.....	.....	3,171 77	Dec. 1916....	1	11
2 13	.....	.....	.....	.....	.....	.....
13 75	.....	.....	840 47	Dec., 1915....	2	11
43 07	.....	.....	5,493 81	July, 1916....	2	4
35 81	.....	.....	2,171 10	Dec., 1915....	2	11
32 00	.....	.....	2,207 95	Dec., 1915....	2	11
6 88	.....	.....	239 26	April, 1918....	.....	7
16 71	.....	.....	1,195 29	Dec., 1915....	2	11
18 49	.....	.....	476 63	Dec., 1916....	1	11
98 04	.....	744 98	.....	Sep., 1916....	2	2
3 32	.....	.....	1,925 54	May, 1916....	2	6
.....	.....	359 04	.....	.....	.....	.....
34 07	.....	.....	1,175 25	Mar., 1916....	2	8
57 69	.....	.....	10,635 46	Dec., 1915....	2	11
55 99	.....	.....	1,925 87	July, 1916....	2	4
495 34	.....	9,091 43	.....	Dec., 1915....	2	11
46 71	.....	.....	1,852 35	July, 1916....	2	4
6 23	.....	.....	1,668 38	Feb., 1918....	.....	11
1,041 58	.....	10,195 45	35,338 50	Net deficit—\$25,143 05		
4 65						
844 77						
16 35						
.....						
10,120 47						
404 82						
4,610 71						
17,043 35						
.....						
325 74						
16,717 61	.....	.....	.....	Net Deficit—\$25,143 05		

## ST. LAWRENCE

Statement Showing Cost of Power, Operating Expenses, Fixed Charges  
the Year Ending

Municipality	Rate per Horse Power Collected	Average Horse Power	Cost of Power	Operating, Maintenance and Administra- tion Expenses	Interest	Total Expenses
	\$ c.		\$ c.	\$ c.	\$ c.	\$ c.
Brockville .....	30 00	322.4	2,913 30	3,693 21	3,316 53	9,923 04
Chesterville .....	46 00	103.7	937 06	1,637 07	1,410 32	3,984 45
Prescott .....	25 00	209.6	1,894 02	1,145 38	1,275 88	4,315 28
Williamsburg .....	30 00	16.9	230 89	215 95	243 82	690 66
Winchester, .....	43 00	64.7	584 64	651 39	584 36	1,820 39
Total Municipalities. ....		717.3	6,559 91	7,343 00	6,830 91	20,733 82



SYSTEM

and Revenue also the Net Surplus or Deficit for Each Municipality for October 31st, 1918

Revenue from Municipalities	Surplus or Deficit after paying Cost of Power, Oper- ating, Maintenance & Interest		Fixed Charges		Net Surplus or Deficit for Year	
	Surplus	Deficit	Renewals	Contingencies	Surplus	Deficit
\$ c. 9,672 50	\$ c. .....	\$ c. 250 54	\$ c. 3,316 53	\$ c. 80 60	\$ c. .....	\$ c. 3,647 67
4,779 20	785 75	.....	1,410 32	25 92	.....	650 49
4,948 72	633 44	.. .. .	1,275 88	52 40	.....	694 84
494 83	.....	195 83	243 82	4 23	.....	443 88
2,780 29	959 90	.....	584 36	16 17	359 37	.....
22,666 54	2,379 09	446 37	6,830 91	179 32	359 37	5,436 88

ST. LAWRENCE

Statement showing "Reserve for Renewals," "Reserve for Contingencies,"  
Municipality to

	Surplus or Deficit after Paying Cost of Power, Operating, Maintenance and Interest		Reserve for Renewals
	Surplus	Deficit	
	\$ c.	\$ c.	\$ c.
Brockville .....	4,579 49	.....	10,453 64
Chesterville .....	393 25	.....	6,654 28
Prescott .....	6,614 41	.....	6,576 11
Williamsburg .....	.....	491 79	660 74
Winchester .....	.....	1,768 03	5,949 13
Total Municipalities .....	11,587 15	2,259 82	30,293 90
Interest .....	.....	.....	2,240 27
Grand Total .....	.....	.....	32,534 17

SYSTEM

“Reserve for Sinking Fund” and the “Net Surplus” or “Deficit” of each  
October 31, 1918

Reserve for Contingencies	Net Surplus or Deficit		Period of Operation		
	Surplus	Deficit	Date Commenced	Years	Months
\$ c.	\$ c.	\$ c.			
157 40	.....	6,031 55	Apr., 1915	2	7
44 37	.....	6,305 40	Mar., 1914	3	8
103 92	.....	65 62	Dec., 1913	4	11
9 48	.....	1,162 01	Apr., 1915	2	7
31 62	.....	7,748 78	Jan., 1914	3	10
346 79	.....	21,313 36			
6 68	.....	.....			
353 47	.....	.....	Net Deficit.....\$21,313.36		

THUNDER BAY

Statement showing Cost of Power, Operating Expenses,  
for the year ending

Municipality	Rate per Horse Power Collected	Average Horse Power	Cost of Power	Operating, Mainten- ance and Adminis- tration Expenses
Port Arthur .....	\$ c. 19 75 *517 22	\$ c. 3,835.3	\$ c. 58,254 06	\$ c. 8,147 30

\*Per month



SYSTEM

Fixed Charges, Revenue and Net Surplus  
October 31st, 1918

Interest	Total Expenses	Revenue from Muni- cipalities	Surplus or Deficit after paying cost of Power, Operating, Maintenance and Interest		Fixed Charges		Net Surplus
			Surplus	Deficit	Renewals	Contin- gencies	
\$ c. 4,382 88	\$ c. 70,784 24	\$ c. 82,753 31	\$ c. 11,969 07	\$ c.  .....	\$ c. 3,855 02	\$ c. 958 90	\$ c. 7,175 15

THUNDER BAY

Statement Showing "Reserve for Renewals," "Reserve for Contingencies,"  
Municipality to

	Surplus or Deficit after paying Cost of Power, Operating, Maintenance and Interest		Reserve for Renewals	Reserve for Contingencies
	Surplus	Deficit		
Port Arthur.....	\$ c. 50,857 47	\$ c. .....	\$ c. 25,618 51	\$ c. 1,561 40
Interest.....	.....	.....	3,318 96	24 09
Grand Total .....	.....	.....	28,937 47	1,585 49

## SYSTEM

"Reserve for Sinking Fund." and the "Net Surplus" or "Deficit" of Each October 31st, 1918

Reserve for Sinking Fund	Net Surplus or Deficit		Period of Operation		
	Surplus	Deficit	Date Commenced	Years	Months
\$ c. 14,898 16	\$ c. 9,296 72	\$ c. .....	Dec., 1910	7	11
.....	.....	.....	.....	.....	.....
14,898 16	9,296 72	.....	Net Surplus..... \$9,296 72		

## MUSKOKA

Statement showing Cost of Power, Operating Expenses, Fixed Charges  
the Year ending

Municipality	Rate per Horse Power Collected	Average Horse Power	Operating, Mainten- ance and Adminis- tration Expenses	Interest	Total Expenses
			\$ c.	\$ c.	\$ c.
Gravenhurst .....	12.56	321.6	2,668 13	1,709 32	4,377 45
Huntsville .....	22.51	667.3	5,974 11	6,210 27	12,184 38
Muskoka Falls .....	.....	.....	.....	11 36	11 36
Total Municipalities ..	.....	988.9	8,642 24	7,930 95	16,573 19



SYSTEM

and Revenue, also the Net Surplus or Deficit for each Municipality for October 31, 1918

Revenue from Muni- cipalities	Surplus or Deficit after Paying Cost of Power, Operating, Maintenance and Interest		Fixed Charges		Net Surplus or Deficit for Year	
	Surplus	Deficit	Renewals	Contingencies	Surplus	Deficit
\$ c. 4,038 84	\$ c. .....	\$ c. 338 61	\$ c. 1,495 65	\$ c. 80 40	\$ c. .....	\$ c. 1,914 66
15,019 99	2,835 61	.....	5,433 99	166 83	.....	2,765 21
59 50	48 14	.....	9 94	.....	38 20	.....
19,118 33	2,883 75	338 61	6,939 58	247 23	38 20	4,679 87

## MUSKOKA

Statement Showing "Reserve for Renewals," "Reserve for Contingencies,"  
Municipality to

	Surplus or Deficit after paying Cost of Power, Operating. Maintenance and Interest		Reserve for Renewals
	Surplus	Deficit	
	\$ c.	\$ c.	\$ c.
Gravenhurst .....		853 90	2,417 69
Huntsville .....	5,284 52		10,370 01
Total Municipalities .....	5,284 52	853 90	12,787 70
Interest .....			234 32
Renewals Reserve on Muskoka Falls Equipment .....			9 94
Rental on Equipment .....			
Profit on Sales of Power at Muskoka Falls. Applied to "Reserve for Con- tingencies" .....			
Interest .....			
			13,031 96
Deduct—Cost of Renewals to date....			1,160 12
Grand Total .....			11,871 84

SYSTEM

“ Reserve for Sinking Fund,” and the “ Net Surplus ” or “ Deficit ” of each  
October 31, 1918

Reserve for Contingencies	Net Surplus or Deficit		Period of Operation		
	Surplus	Deficit	Date Commenced	Years	Months
\$ c.	\$ c.	\$ c.			
147 35	.....	3,418 94	Nov. 1915	3	.....
351 90	.....	5,437 39	Sept. 1916	2	2
499 25	.....	8,856 33			
10 08	.....				
.....	.....				
119 52	.....				
.....	.....				
95 25	.....				
2 28	.....				
726 38	.....				
.....	.....				
726 38	.....		Net deficit, \$8,856 33		

## CENTRAL ONTARIO SYSTEM

Operated by the Hydro Electric Power Commission of Ontario—Statement of Assets and Liabilities, October 31, 1918

<i>Assets.</i>		<i>Liabilities.</i>	
Central Ontario:		Provincial Treasurer:	
Power Developments and Hydraulic Rights .....	\$4,282,077 90	Purchase Price of System .....	\$8,350,000 00
Transmission Lines .....	1,436,658 84	Debentures issued in connection with purchase of Bruton Township Pulpwood area .....	225,000 00
Transformer Stations .....	919,860 85	Cash advances .....	1,893,185 00
Local Utilities—Electric, Gas, Water and Street Railway .....	1,950,018 41		\$10,468,185 00
Nipissing (Northern Ontario):		Accounts Payable .....	\$39,808 80
Power Development and Steam Plant .....	\$314,620 66	Consumers' Deposits .....	3,056 78
Transmission Lines .....	43,322 00	Unearned Water Revenue .....	2,022 94
Transformer Stations .....	31,826 30		44,888 52
Local Utilities—Electric .....		Reserve for Renewals .....	412,878 86
Pulpmill and Pulpwood Areas .....		Reserve for Contingencies .....	2,311 66
Rural Lines .....		Sinking Fund .....	7,611 56
Inventories:			
Tools and Equipment .....	\$36,741 96		
Materials and Supplies .....	372,899 68		
	409,641 64		
Accounts Receivable:			
Power and Pulpmill Accounts .....	\$117,732 49		
Consumers' Supply—Sales Accounts .....	12,288 24		
Consumers' Light and Power—Sales Accounts .....	71,961 72		
	\$201,982 45		
Less Reserve for Doubtful Accounts.	10,500 00		
	191,482 45		
Due by Hydro-Electric Power Commission .....	683,177 27		
Expenses and Insurance prepaid .....	2,460 15		
Advances on Contracts for Pulpwood .....	9,221 90		
Bruton Township Suspense Account .....	17,323 86		
Operating Deficit .....	8,323 02		
	\$10,935,875 60		\$10,935,875 60



## SECTION IV

### CONSTRUCTION WORK OF THE COMMISSION

#### NIAGARA SYSTEM

##### EXTENSION TO THE ONTARIO POWER COMPANY'S PLANT

Owing to the power shortage caused by the extra energy needed for essential war industries and the fact that two of the plants at Niagara Falls had reached their capacity, work was commenced in March, 1918, for the extension to the hydro-electric plant of the Ontario Power Co., at Niagara Falls, Ontario, which when completed, will furnish an additional 40,000 to 50,000 horse-power.

The construction of this extension involved the excavation of 133,000 yards of earth and 14,000 yards of rock to permit the placing and erection of a 13.5 foot diameter wood stave pipe 6,700 feet long, a 13.5 foot diameter steel distributor 179.5 feet long, a 60 foot diameter steel differential surge tank 94 feet high, four Johnson hydraulic operated valves, two 10.5 foot diameter penstocks and two 20,000 horse-power turbines with direct connected generators, also the erection of the additional power house to house these units.

The unique features about this extension are the wood stave pipe which is one of the largest ever built, the differential surge tank which has the largest diameter and has also the greatest height of any similar tank not equipped with an auxiliary spillway, and the power house walls which were designed to withstand a pressure due to a 40 foot rise in tailwater elevation, this extraordinary condition having occurred in the year 1909.

The present plant of the Ontario Power Company as now controlled and operated by the Hydro-Electric Power Commission, consists of an installation of fourteen turbines, seven with a rated capacity of 11,800 horse-power, five rated at 15,000 horse-power and two at 16,000 horse-power, making a total of 189,600 horse-power. The generators, which are direct connected, have a total rating of 149,012 kv-a. Water is supplied through two 18 foot diameter conduits,



Elevation Showing Power House at foot of Cliff. Extension at the right—on bank, from left to right: Table Rock House, No. 1 and No. 2 Surge Tanks, Reflectory, and New Surge Tank at extreme right. Above, Distributing Station.



Trench for Wood Stave Pipe Through Rock Section, showing tunnel beneath International Railway Company's Tracks. Both sides of cut are channelled here.



Rock Excavation in Pipe Trench Near International Railway Crossing. Ingersoll-Rand Rock Drills at Work.

each approximately 6,600 feet long having a combined maximum capacity of about 162,000 horse-power.

No. 1 conduit, which is of steel plate construction, was installed in 1903, while No. 2 conduit, which is of reinforced concrete construction, was installed in 1910. This second conduit, when inspected in April, 1918, after being in service eight years, showed no signs of cavitation or deterioration, although a velocity of 25 to 28 feet per second had been maintained during operation, nor was there any vegetable growth whatever appearing on the walls.

No. 3 conduit which is now being installed is 13.5 feet inside diameter. The staves are of B. C. fir 4 inches thick by 6 inches wide and banded with  $\frac{7}{8}$  inch diameter steel bands, in two sections with two shoes. The pipe is carried on timber saddles spaced at  $4\frac{1}{2}$  foot centres except where the pipe is concreted in place.

The excavation for trench for the wood stave pipe line was handled from the cut by shovels, derricks, and locomotive cranes. The difficulties in this work were varied and in some places severe due to the close proximity of No. 2 conduit and to large quantities of water which were encountered at the upper end of the pipe line and at Dufferin Island crossing. A portion of the excavation was deposited along the sides of the cut for back-fill, while the remainder was placed on dumps located at convenient points.

The saddles used to support the pipe are built-up timber sections so constructed as to make a continuous form for the lower half of the pipe. Mud sills were used under the saddles through the earth cut, in order to distribute the load of the pipe and prevent settlement as far as possible. Through the rock cut the mud sills were left out and the lower limits of the saddles were placed on the rock which was evened up, to grade after excavating the trench.

On account of the bottom of the trench being below the water level in the Niagara River for the greater portion of its length it was necessary to provide ample drainage for the pipe trench. The drainage system consisted of two vitrified tile drains one on either side of the pipe trench, laid with open joints in broken stone. These two tile drains run from Station 9+00 on the conduit to the steel distributor, where they are connected to the penstock drains which carry the drainage water down through the power house to the lower river.

For 1,000 feet at the upper end, and 825 feet at the lower end, the pipe is concreted in place. This was necessary in order to allow the pipe in these sections of the trench to be backfilled and thus restore the surface of the park to its original condition.

The steel distributor at the lower end of the wood stave pipe is made of  $\frac{5}{8}$  inch steel plate and is 13.5 feet in diameter and 179.5 feet long. Four penstocks are connected to this distributor by means of bell mouthed tees made of  $\frac{1}{2}$  inch steel plate. The distributor is incased in concrete so as to allow the surface of the park above it to be restored to its original condition. A section of 13.5 foot diameter reinforced concrete pipe 77 feet long connects the distributor with the surge tank.

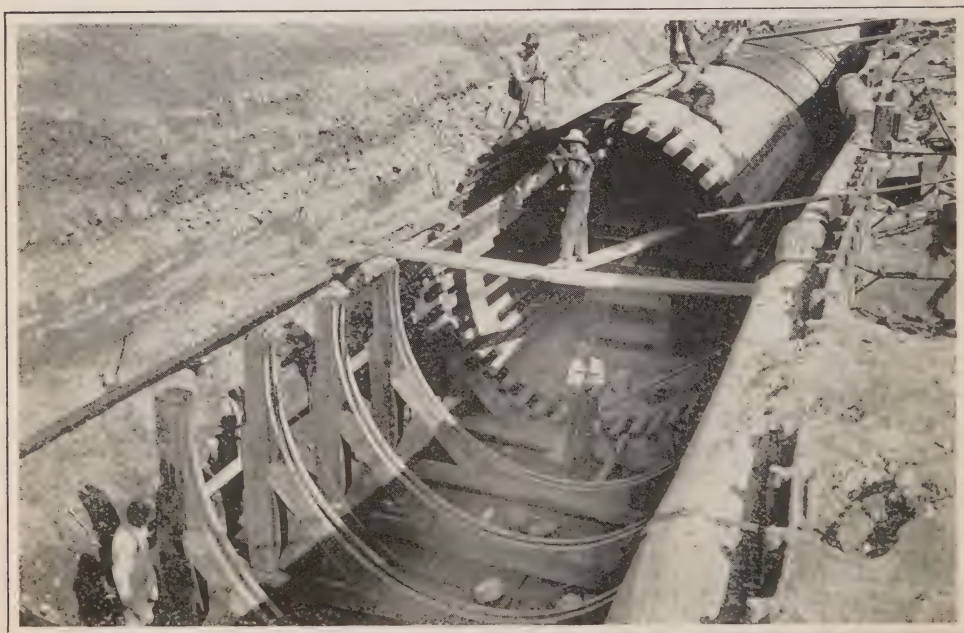
The surge tank is of the Johnson differential type. The tank is built of steel plate varying in thickness from  $\frac{1}{4}$  inch plate at the top to one inch plate at the bottom, while the internal riser is built of  $\frac{1}{2}$  inch plate. The roof for the tank is constructed of steel roof trusses with wood covering.

Penstocks Nos. 15 and 16 which deliver the water to the two new turbines in the power house are 216 feet in length. Each penstock ends in a supply pipe with taper connections bolted to the spiral casings of the turbine. The steel





No. 3 Conduit Completed, Showing Method of Bracing Lackawanna Steel Sheet Piling Between Conduits Nos. 2 and 3.



Erection of Wood Stave Pipe, using saddles as forms.





No. 15 Draft Tube Forms in Position, Ready for Concreting.

plate used in the construction of the penstock varies in thickness from  $\frac{3}{8}$  inch at the upper end to 13-16 inches at the lower end. The supply pipes are constructed of 13-16 inch plate throughout. The penstocks are designed for a pressure equal to 150 feet of head at the upper end increasing to 320 feet at the lower end,



Excavation for Distributor and Valve Chamber.

these figures including pressure rise due to a turbine gate closure time of three seconds, with relief valve closed.

After the penstocks are erected the space between the excavation and the outside of the pipe will be filled in with lean concrete. This will hold the penstock in position and protect the outside from corrosion.

The water wheels are double runner, central discharge turbines with spiral casings, running at 187.5 r.p.m. and delivering 20,000 horse-power under 180 foot head. The turbine gates are operated by vertical servo-motors which are controlled by actuators mounted on the gallery. These actuators are equipped with distance speed controllers, hydraulic hand controllers, gate limiting device, manual speed adjuster, gate opening indicator and tachometer. The pressure oil for operating





No. 3 Conduit, showing mudsills in position. No. 2 Concrete Conduit exposed.



Wood Stave Pipe, showing details of Bands, Shoes and Saddles.



Excavation at Site of Power House Extension.



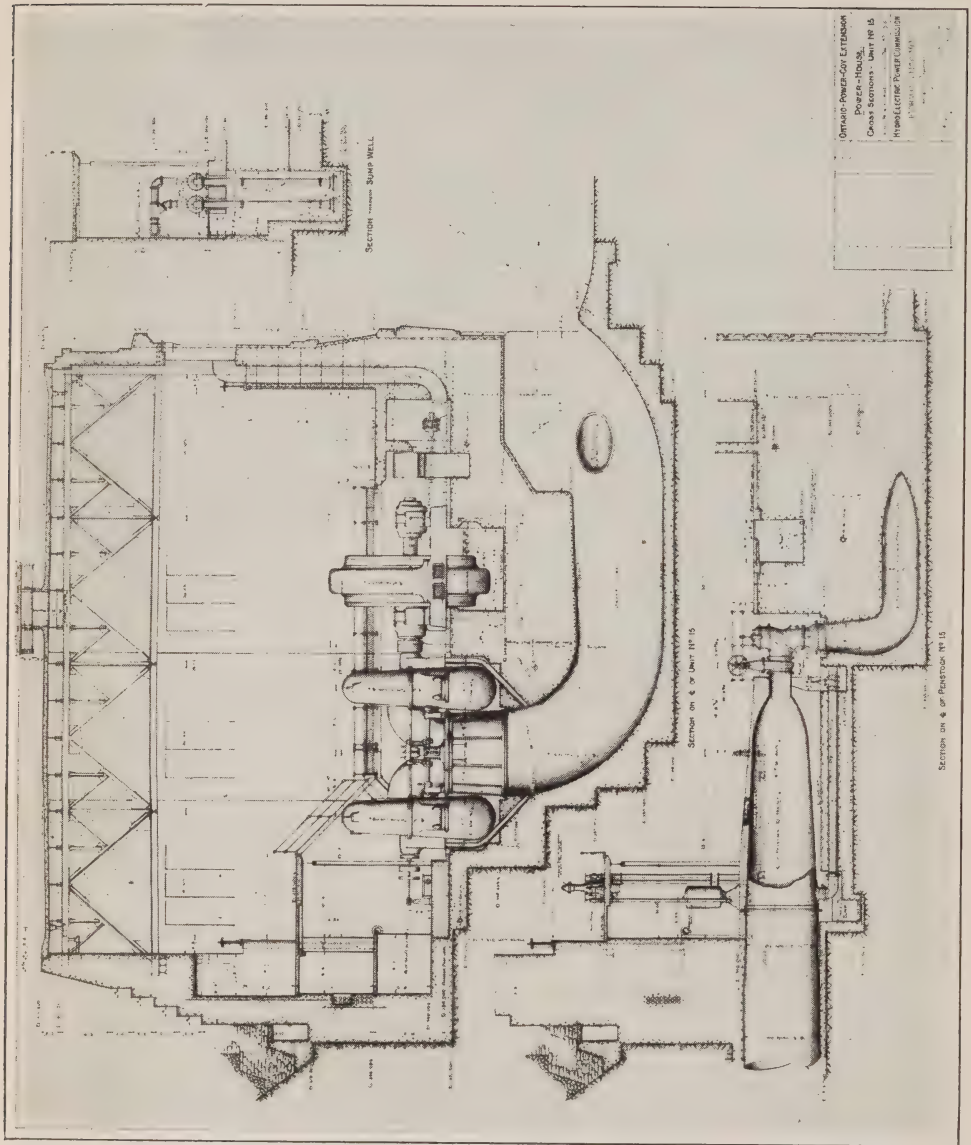
Excavation for Surge Tank and Riser. Sullivan Channellers at Work.





Scaling Loose Material from Cliff above Power House Site. International Arch Bridge in Background.

servo-motors is furnished by helical gear rotary pump, delivering 62.5 gallons per minute against 200 lbs. pressure. The sump tanks are each of 350 gallons capacity and are provided with screens for cleaning the oil before it is returned to the pressure tank. The power house is of concrete and structural steel construction. In the substructure plain concrete has been used throughout except for the concrete over the draft tubes, which has been reinforced for the upward



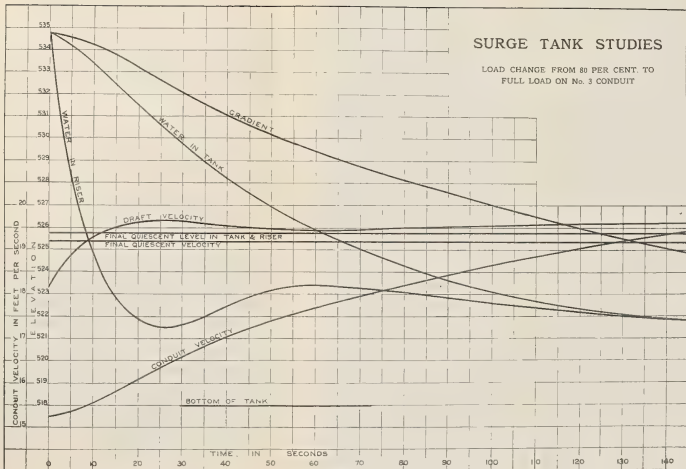
Section Through Power House Extension on centre line of No. 15 unit. Also section of No. 15 Penstock.

pressure which will occur with high water in the river. The generator pits, air ducts and sump well are also reinforced to prevent injury developing from the temporary severe loading of portions of the structure during the erection of the units and from vibration when the plant is in operation. In the superstructure reinforced and plain concrete and structural steel is used.

In order to protect the power house against a recurrence of the high water conditions which prevailed in 1909 the window sills in the front and end walls were placed at elevation 388 and the walls designed to withstand pressure due to water at this elevation on the outside power house.

# SURGE TANK STUDIES

LOAD CHANGE FROM 80 PER CENT. TO  
FULL LOAD ON No. 3 CONDUIT







The hydraulics of the plant are of more than ordinary interest due to the fact that each of the three pipe lines and surge tanks that have been installed differ considerably. For this reason an excellent opportunity is presented of making a comparison of their respective hydraulic characteristics and capacities.

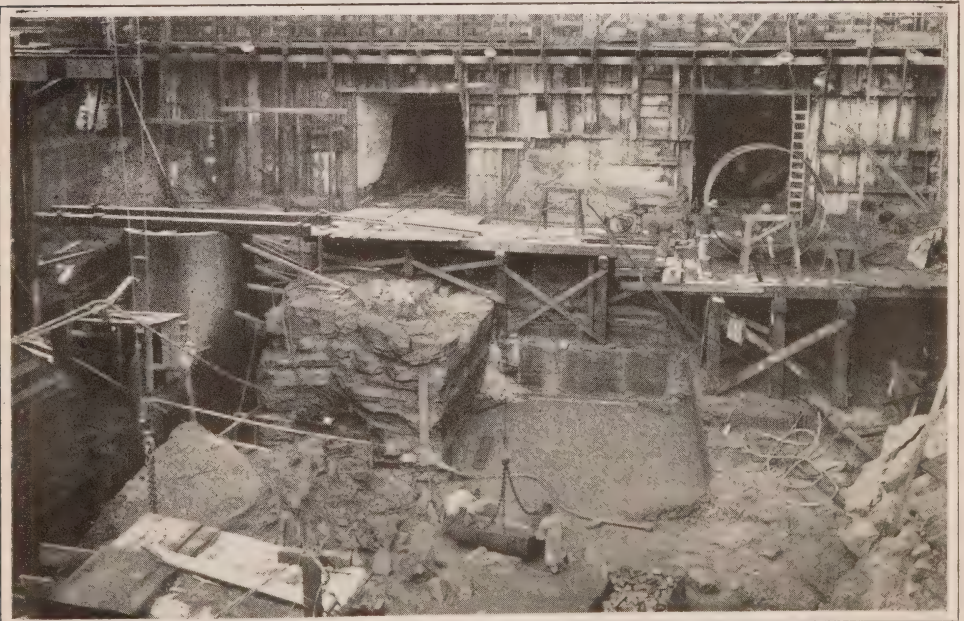
No. 1 tank has very little capacity and is of the simple tank type. Its only function is to limit the surge pressure on conduit No. 1 during load changes, and provides entrance to a spillway for discharge of water at times of load rejection.

No. 2 surge tank, of the Johnson differential type, was the first tank of this character ever built. This tank serves the double purpose of relieving pressure surges and furnishing or storing water during load changes while the velocity in conduit No. 2 is being accelerated or decelerated. It is also equipped with a spillway as an additional safeguard, to prevent spilling over the top at times of abnormal surge, and to limit the height which would have been required without this provision.

No. 3 surge tank is of the same type as No. 2, but has no spillway. Its design is such that full load rejection under the most abnormal conditions will not cause overflow.

During 1913, a series of tests were made to determine the hydraulic characteristics and carrying capacities of conduits Nos. 1 and 2, also of penstocks Nos. 1 to 14, inclusive. The results of these tests indicate some very striking facts regarding the relatively greater carrying capacity of concrete pipe as compared with riveted steel and also the exceedingly smooth surface that can be obtained with concrete if proper and careful construction methods are used.

The capacity of No. 3 conduit, which is of wood stave construction, is 2,750 cubic feet per second, giving a velocity of 19.2 feet per second in the pipe on



Power House Extension Site Ready for Forms. Two Tunnel Portals Appear in Background, with Penstock No. 16 being Assembled. Draft Tube Form for No. 15 in Position at Left.



Surge Tank Floor Assembled Ready to Lower onto Foundation.

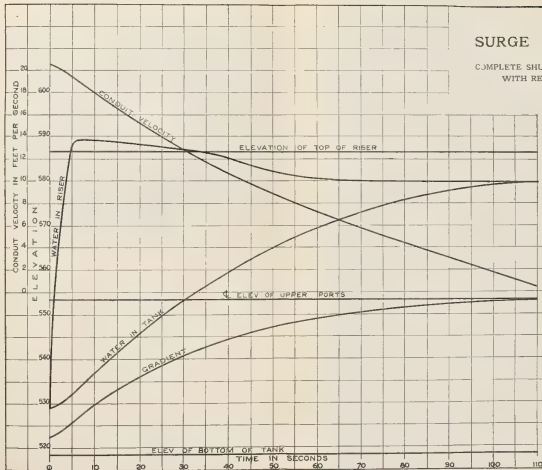
the basis of a coefficient of roughness " $C$ "=135 in the Williams and Hazen formula. Under such conditions, there will be a total loss in the conduit, from gate house to penstock, of 32 feet, which includes entry losses, friction loss and velocity head. This figure was arrived by assuming low water elevation in forebay at 554, and the minimum elevation of the gradient at penstock No. 15 at 522, which is eight feet above the top of the conduit. From past experience with conduits Nos. 1 and 2, it was found advisable not to go below elevation 522 in order to prevent the gradient being drawn down below the top of the pipe under operating conditions. Under the above conditions the capacity of the pipe will be approximately 45,000 turbine horse-power. With a coefficient of roughness  $C$ =150 in Williams and Hazen formula, which value is within the limits of possibility, and the same total loss of 32 feet, the discharge capacity would be 2,930 cubic feet per second with a velocity of 20.5 feet per second in the pipe. This quantity of water in turn would give approximately 48,000 turbine horse-power. In comparing the coefficients of roughness of the concrete and steel pipes, as obtained by test, and the assumed coefficient of roughness for the wood stave pipe, based on the tests published by the U. S. Department of Agriculture, it appears that the concrete pipe has the highest coefficient, with the wood stave pipe a good second, and the steel pipe a poor third.

A coefficient of roughness of 100 in Williams and Hazen formula was used in figuring the losses in the steel penstocks. The use of this coefficient was based on the result of tests on the other penstocks.

It was, of course, necessary to design the tank for a drop of full load on No. 3 conduit, under which condition the tank will receive all water without the provision of a spillway, and on the assumption that none of the pressure regulators on the turbines in the power house are in service. The conditions of design for load thrown on, was that of an increment of load equivalent to a 20 per cent. velocity change from 80 per cent., up to full capacity of the conduit.

# SURGE TANK STUDIES

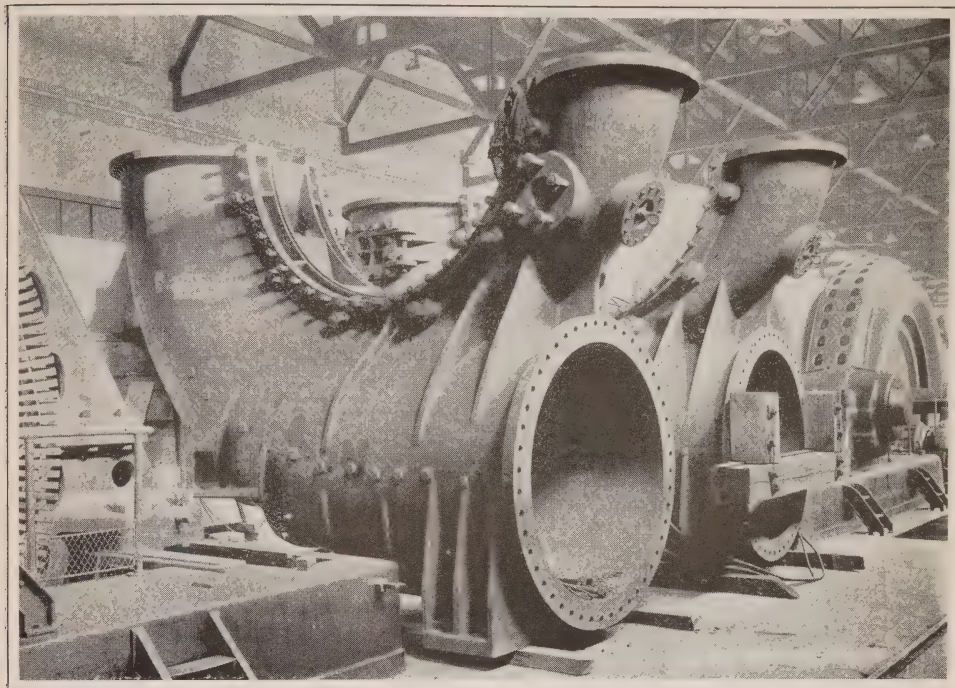
COMPLETE SHUT-DOWN ON No. 3 CONDUIT  
WITH RELIEF VALVES CLOSED











Bottom Sections of Spiral Casings of Turbines, Nos. 15 and 16.

### QUEENSTON-CHIPPAWA POWER DEVELOPMENT

After three years of exhaustive surveys and investigation, the route for the Queenston-Chippawa Power Canal was finally fixed in 1917. This route is about  $12\frac{3}{4}$  miles long, with the intake on the Niagara River at Hog Island, Chippawa, about two miles above Niagara Falls, and the tailrace on the Niagara River about one mile above Queenston. The intake will be in what is known as the Grass Island Pool of the Niagara River. The mean monthly elevation of this pool varies about one foot.

The normal mean elevation of Lake Erie is 573 feet; of Grass Island Pool, 563; of the Niagara Power at the power house site, 247; and of Lake Ontario, 245. Probably no river has a more uniform regimen than the Niagara. The minimum flow is about half the maximum, and over a period of fifty years the maximum difference in mean monthly levels under normal conditions, either at Queenston or Chippawa, amounts to only about six feet.

The best intake and power house locations were first determined upon, with a view to the maximum utilization of the available head, and contours and borings were then studied to decide by what route a canal could connect those two points to the best hydraulic and economic advantage. The intake was located at Hog Island partly on account of that point being just above the critical section at which the water begins to speed up for its passage over the Falls. Location further up the river would have meant a larger canal and further downstream would have necessitated a loss of head. Another reason equally important for locating the intake at Chippawa was the use which could be made of the natural channel of the



An electric locomotive and train of 20-yard dump cars. Queenston Development.



Dredging River Section, Bucket Unloading, West Bank, June 6, 1918.

LAKE ONTARIO







Welland River—often called Chippawa Creek—which comprises about  $4\frac{1}{4}$  miles of the route of the Canal, leaving only about  $8\frac{1}{2}$  miles to be excavated, although the Welland River will have to be somewhat deepened. The flow of the Welland River, which is a sluggish stream with a very flat gradient, will be reversed.

This  $8\frac{1}{2}$  miles of excavated section compared with  $19\frac{1}{2}$  miles for the old Jordan-Erie scheme, and the net head is 305 feet, compared with a possible 299 feet for the Jordan-Erie project.

Ice troubles that would have been experienced with the latter project will be much more readily overcome with the new scheme.

The gradients adopted for the Canal average about one foot per mile, or a total of about eight feet in the  $8\frac{1}{2}$  miles of excavated canal. The loss of head in the penstocks, due to friction, may amount to upwards of two and a half feet, and the loss in the Welland River from Hog Island to Montrose, where the excavated canal begins, will be about 6 inches, under maximum load, so that the total loss of head will be about 11 feet, making the net effective head about three hundred and five feet under normal conditions. Thus, of the 327 feet normal difference in level between the two lakes, only 22 feet head will be lost—10 feet between Lake Erie and Hog Island and 11 feet between the intake and the tailrace, and two feet between the point of discharge of the tail water and Lake Ontario.

The power house will be located in the bottom of the gorge, about three-quarters of a mile above the Lewiston Bridge, just below where the last rough water disappears.

The cliffs are nearly vertical at this point, and as the gatehouse will be on the cliff immediately above the power house, the penstocks will be nearly vertical and only about 450 feet long, thus reducing cost and head loss to a minimum.

With this scheme of development about 30 h.p. will be obtained from each second-foot of water used, compared with about 14 h.p. per second-foot obtained by the existing plants at Niagara Falls. With 36,000 the whole Treaty allotment of second-feet available over 1,000,000 h.p. could be similarly developed, as compared with less than half that amount at the heads under which the present plants at Niagara Falls are operating.

All of the excavated section of the canal will be in solid rock, with the exception of  $1\frac{1}{4}$  miles of earth section running north from the Welland River and half a mile of earth section across the whirlpool ravine. These sections will be trapezoidal in shape, lined with rip-rap. The section at the whirlpool will also be faced with concrete.

The rock section is 48 feet wide at the bottom, with perpendicular sides, the average wetted section being 35 feet deep and lined with concrete. The velocity in the rock section will be about 6 feet per second when the plant is under maximum load. The earth overburden above the rock surface will be generally sloped  $1\frac{1}{2}$  to 1, but a flatter slope is provided for where local conditions require it.

The Commission has purchased a tract of land as a right-of-way which will be sufficient for all present and future needs. This right-of-way includes about 200 acres near St. David's which will be used as a dump for the disposal of excavated earth and rock.

There will be control works at the head of the excavated canal near Montrose, but from there the canal will be unobstructed until the forebay location is reached, which is at Smeaton's ravine. At a point 2,400 feet distant from the gatehouse, the canal widens into the forebay, the forebay gradually increasing in width to four hundred feet, which will be the approximate overall length of the gate house. The



Shovel No. 1 excavating August 7, 1918.



An electric train being loaded by Shovel No. 1.

initial development provides for four steel penstocks each about 14 feet in diameter, 450 feet long, and one exciter penstock, about 5 feet diameter.

Provision has also been made for the installation of four main generating units each of 50,000 h.p. capacity. Both the gate house and the power house are so designed that they may be extended whenever conditions warrant and practically to any desired extent.

The turbines will be of the single runner type, probably with cast steel scroll cases. The specifications call for  $187\frac{1}{2}$  r.p.m., which is the maximum safe speed giving satisfactory hydraulic characteristics. The specifications for the turbines have been prepared by the Commission and prices will be secured in the near



Electric shovel lifting 8 cubic yards of earth 70 feet.

future. Although these turbines will have the greatest capacity of any water turbines yet designed, they will not be so large in overall dimensions as some others that have been built to operate at lower heads.

The power will be taken off the generators at 12,000 volts and will be stepped up, probably to 110,000 volts for long distance transmission. Elaborate arrangements will be made not only for leading cool air to the generators, but, what is more unusual, for taking the heated air out of the power house. Large ducts will lead cold air to below the rotors, and after the air has gone through the generators, it will be carried away in flues. There is also a scheme for removing the runners from the turbines without dismantling the turbines and generators, which will weigh about 1,000 tons, the moving parts weighing about 500 tons. Each draft tube will be so arranged that the runner can be dropped into the draft tube, loaded into a car, pulled through a tunnel and lifted through a shaft by a crane, so that



repairs can be effected without dismantling the unit. The power house will be served by two 150-ton electric cranes.

The surveys for the work were begun in 1914 and continued for nearly two years. During the year 1917 the construction plant was brought onto the job and assembled, and during the first part of 1918 the camps were completed.

The main equipment for the earth and rock excavation consists of the two largest electrically driven shovels ever built. They are of the revolving type, built by the Bucyrus Company, and are fitted with an 8-cubic-yard bucket for excavation in earth, and a 5-cubic-yard bucket for rock work. The boom on No. 1 shovel is 90 feet long, and the dipper stick 58 feet. The boom on No. 2 shovel is 80 feet long and the dipper stick 54 feet. Either shovel can load dump-cars which stand on a track the level of which is 62 feet above the level of the tracks on which the



Excavation east from Bowman's Ravine, September 6, 1918—Queenston Development.

shovel stands. The shovel rests on two tracks (four rails) 30 feet centre to centre and is mounted on 16 wheels. The nominal horse-power of each of the two shovels is 715 h.p., upon a half-hour intermittent rating. Each shovel weighs over 300 tons, contains 75 tons of ballast, and has a capacity of 3,000 to 5,000 cubic yards per 10 hour day when handling earth. Another of these large shovels has been purchased and will be delivered in March, 1919.

There are also five other electrically-driven shovels at work, having dipper capacities ranging from  $\frac{7}{8}$  cubic yards to  $4\frac{1}{2}$  cubic yards.

At the Welland River section of the canal, a Lidgerwood cable excavator is at work, fitted with a 3-cubic-yard Andreson-Evans clam. The cableway has an 80-foot head tower and 60-foot tail tower, and has a span of 800 feet. The excavated material is being disposed of along the north bank of the river. The width of the Welland River at the water line averages about 300 feet.

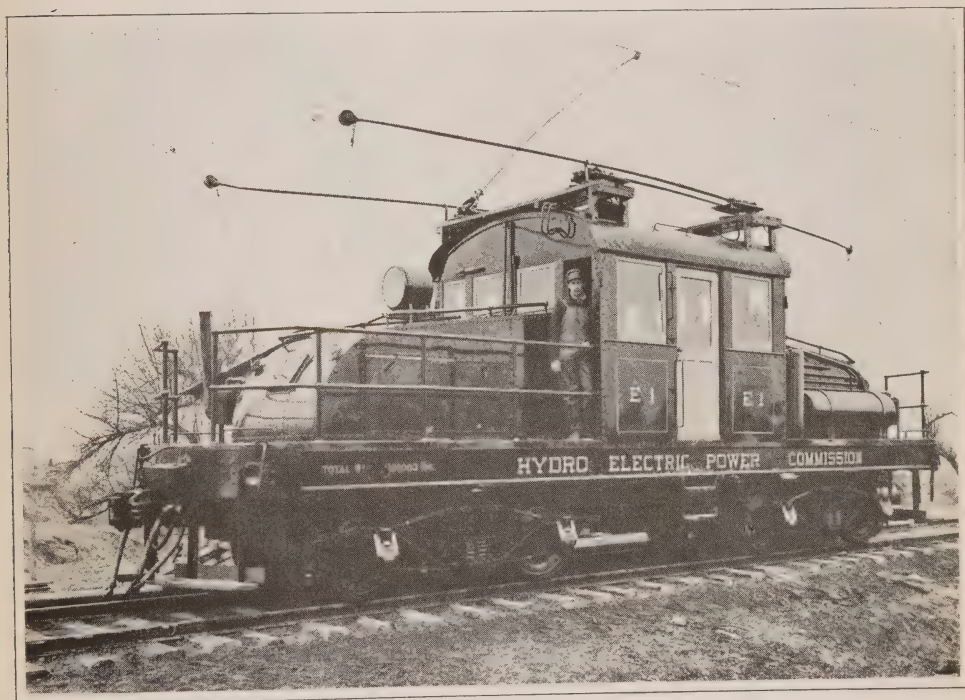
The Commission has purchased one hundred and fifty 20-yard Western air-dump cars, each of 80,000 pounds capacity; also seven 40-ton steam locomotives



and twelve 50-ton electric locomotives. The steam locomotives are switchers purchased from the Pennsylvania Railroad. The electric locomotives were built by the National Steel Car Company, Limited, of Hamilton, Ontario, six of them being constructed with General Electric equipment and six with Westinghouse equipment. Two pile-drivers are at work on the river section. There are three 40-ton and two 15-ton Bay City locomotive cranes for general utility work.

It is estimated that 9,000,000 cubic yards of earth and 4,000,000 cubic yards of rock must be removed from the excavated section; and from the river section, 2,000,000 cubic yards of material, mostly earth.

At the present time the material which is being excavated from the Whirlpool section is being used to fill the old Whirlpool gulley, but the main dump will be at



Electric locomotive used for hauling on disposal railway, Queenston Development.

St. David's. A double-track railway line is being built for the full length of the canal from Montrose to the forebay, and a  $2\frac{1}{2}$  mile span connects the main line with the St. David's dump.

There will be various other branches of the railway constructed from time to time as needed. A railway will probably be built from the power house to connect with the Michigan Central at Queenston to bring in the machinery and to take out the material excavated from the power house substructure.

The railroad lines are all electrified, the trolley wires being offset on one side of the track, and carried in clamps devised by the Commission's line construction department. These clamps and the hangers which suspend them from the poles are all made up of standard material, and are so arranged that the temporary use of the material does not injure it. Framed timber trestles are set alongside the dump and other temporary tracks to carry the trolley wire. These trestles are mounted

on wheels or skids and can be moved readily by a locomotive crane when it is necessary to shift the track.

The Commission has its own telephone, water and electric light systems, and has private telephone communication from the Whirlpool to the head office in Toronto.

No. 1 substation is located at the Whirlpool. The power comes into the station from the Ontario Power Company's plant at 12,000 volts and is stepped down to 4,000 volts by three C.G.E. transformers each of 1,500-k.v-a. capacity. The power is distributed up and down the canal at 4,000 volts. Westinghouse and Maloney transformers step some of the power down from 4,000 to 440 volts for use by the shovels. Three rotary converters, each of 500 k.w. supply direct current at 600 volts for railway operation.

At this substation there are now erected four Sullivan belt-driven air compressors, each of 1,000 cubic feet per minute capacity against 125 pounds pressure. They are belt-driven from 230 horse-power 550-volt motors, at 750 r.p.m. As the work progresses additional compressors will be installed in this station. All of the rock drills, channellers and forges, and much of the other equipment, will be driven by compressed air. The air is piped up and down the canal for three miles in each direction, the mains leading from the substation being 10 inches in diameter, reducing to 8 inches and 6 inches. During the coming summer another substation will be built near Montrose, which will be similarly equipped.

In the Whirlpool yards is located a large repair shop containing drills, shapers, planers, lathes, forges, steam-hammers and wood-working machines. The Commission has built about eighty buildings, including bunk houses, freight houses, offices, machine shop, storehouses, substation, etc., also a number of buildings are used which were on various parcels of purchased property.

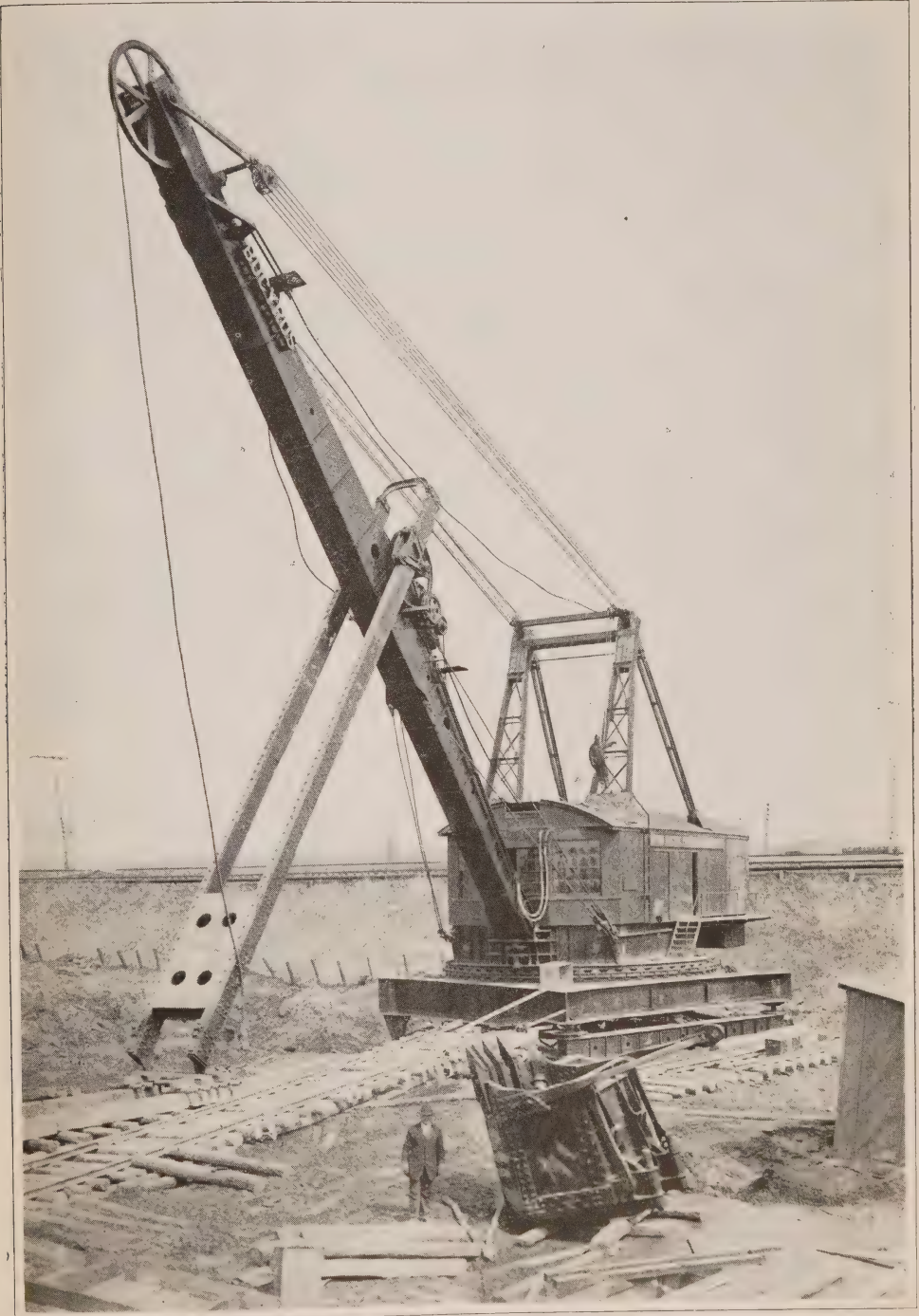
Most of the buildings are of frame construction, but are being "gunited" on the outside over tar paper and wire mesh, using 1 to 3 mix of cement and sand. Sharp concrete sand is being used and the "gunite" applied with cement-guns. The substation, machine shop and all of the more important buildings have already been fireproofed in this manner, and it is the intention to "gunite" most of the other buildings. The bunkhouses are comfortably arranged on the cottage plan.

The crushing plant is located on the forebay. It is equipped with three secondary crushers of the gyratory type and one 84" x 60" Taylor jaw crusher which will have a minimum capacity of 2,000 cubic yards of crushed stone per day.

At the present time the rock excavation at the forebay is on a very small scale, the stone being quarried merely to provide aggregate for concrete work and to supply ballast for the railways. The rock is loaded into skips which are picked up by a locomotive crane and which dump into a bin. A belt conveyor carried the stone from the bin to the crushers and from thence by another conveyor to the cars. This rock is now being mainly used for ballast and for temporary building foundations.

There are four railway bridges to be constructed over the canal, one for the Niagara, St. Catharines and Toronto Railway (electric), one for the Wabash Railroad, one for the Michigan Central Railroad, and one for the Grand Trunk and Michigan Central Railroads. These will be reinforced concrete arch bridges. There will also have to be constructed a number of highways and foot bridges to carry the various roads across the canal. In the concrete work to date, both Canada and St. Mary's cement have been used.





Assembling the world's largest shovel. It is electrically operated and used on the Chippawa-Queenston Development.

Several hydraulic models are being prepared at Dufferin Islands, near the Ontario Power Company's intake in the Niagara River. These models are based on designs prepared by the Commission and are for the purpose of studying the design of the intake at Hog Island. The design of the intake works will be based upon the results of these studies.

During the summer of 1917 the progress of the work was seriously impeded by the abnormal and unprecedented shortage of labor and had it not been for saving in the use of labor resulting from operation of the electric driven construction plant, the work could not have been carried on at all. No betterment in the labor market can be expected while the war is in progress.

## ONTARIO POWER COMPANY

### Extension to Generating Equipment

Instructions were received from the Ontario Power Company in December, 1917, to prepare plans and specifications for an extension to the generating equipment of the company in order to deliver 40,000 of the estimated 50,000 additional horse-power which is to be available from the new No. 3 pipe line now under construction. The remaining amount will be obtained through increased output of the generating units already installed.

The extension is to comprise an addition to the Company's generating station building in the Niagara Gorge and the installation therein of two 15,000-kv-a. generators together with the necessary excitation and switching equipment. Generator cables from the generating station to the Company's distributing station on the top of the cliff and the necessary bus structures, switching and control equipment in the distributing station are also to be provided.

#### Buildings

During the spring of 1918 plans and specifications were prepared for an extension, 90 feet long, to the north end of the generating station. The design of this extension is in general, similar in architectural features to the original building. The main floor will, however, be 10 feet lower in the extension due to the lower setting of the turbines in order to obtain an improvement in hydraulic conditions.

The contract for the structural steel for the extension was awarded to the Standard Steel Construction Company. The erection of the steel and the construction of the building are now being carried out by the Construction Department of the Commission.

No extension to the distributing station building is required but in the north-west corner the present switch room floor will be extended to carry the new oil circuit breakers. Additional switch and bus structures will be built—also a gallery floor for the installation of bus reactors. A section of this gallery will be available for a storeroom.

Drawings were prepared covering this work in the distributing station and the structures will be completed at an early date, the work of construction being carried out by the staff of the Company.

## GENERATING STATION

#### Generators

Specifications were prepared and tenders obtained on two 15,000-kv-a., 75 per cent. power factor, maximum rated, 3-phase, 25-cycle, 187.5-r.p.m. horizontal shaft, water wheel type generators and on January 12, 1918, a contract was



awarded to the Canadian General Electric Company for two such generators, the first to be shipped by October 12th to November 12th, the second by December 12, 1918, to January 12, 1919. These generators have practically the same overall dimensions as the 8,775-kv-a. generators formerly furnished by the same manufacturer to the Ontario Power Company.

Each generator will require 60,000 cubic feet per minute of air to be forced through the ventilating ducts in its armature to enable the machine to carry its rated load with the specified temperature rise. The problem of supplying this ventilation was thoroughly studied by the engineers of the Commission and the scheme adopted involves (a) the enclosure of the sides of the generator armature and rotor above the floor line and the top of the generator pit around the machine, with a sheet steel housing, (b) the installation of a pair of motor driven blowers for each generator to deliver the required volume of air into the generator pit at, or slightly above, atmospheric pressure, and (c) the use of fan blades on the generator rotor to force the air from the pit through the ventilating ducts in the machine.

The cooling air from the outside atmosphere is brought into the power house through ducts formed in the solid concrete of the front wall of the building. These ducts, which have their outside opening high up in the front wall to be above any recorded high water level, extend downward and discharge the air into a common air chamber located under the railroad track runway of the extension. The air is drawn through the ducts into this chamber by the blower units and is discharged directly into the generator pits, the blowers being located between the air chamber and the pits.

The heated air from the generators is discharged into the power house and a ventilating monitor 22 feet by 41½ feet in size is provided in the roof directly over each generator.

Four blower units, each capable of delivering 60,000 cubic feet per minute of air are being supplied by the Canadian Blower and Forge Company. Each of these blowers will be driven by a direct-connected, 35-horse-power, 2,200-volt, 3-phase, Canadian General Electric Company induction motor. One blower unit will be used on each generator for normal operation, the other blower acting as a standby. A duplicate system of power supply will be provided for the blower motors.

A temperature indicating outfit is being provided to indicate the hottest part of each generator winding.

The erection of the generators is to be carried out by the generator contractor and the installation of the remainder of the electrical equipment is to be made by the staff of the Company under the supervision of the Commission's engineers.

#### Exciters

A contract was placed with the Canadian General Electric Company for three 125-kw., 250-volt exciters direct-driven by 185-horse-power, 2,200-volt, 3-phase induction motors.

A 200-horse-power starting auto-transformer and the necessary switching equipment and Tirrill regulators for two exciter units were also ordered from the same manufacturer.

The third exciter set will be used as a spare unit in order to effect immediate replacement in case of a breakdown in one of the two units in operation. This safeguard is necessary since in the system of excitation in use the leads from each exciter armature run direct to a main generator field.

### Generator Cables

A small auxiliary pit is provided in the station substructure on either side of each main generator pit.

The star point leads of each generator will be brought outside of the generator frame and carried in porcelain bushings through the side wall of the generator pit into one of the auxiliary pits where the star point of the machine will be made through current transformers.

The main leads of each generator will be similarly carried into the other auxiliary pit and connected to a pothead bus.

From the pothead pit three 3-conductor cables in parallel will be carried through tile ducts in the station floor and up to a similar pothead bus under each generator switch recess in the back wall of the station.

In the switch recess a Canadian General Electric Company, Type "F." Form "H6," 1,200-ampere, 12,000-volt oil circuit breaker will be installed.

From a second pothead bus at each switch recess, four 3-conductor cables in parallel will be carried in tile ducts in the back wall, along the power house and up through the existing cable tunnel to the distributing station on the top of the cliff.

An extra heavy type of 3-conductor pothead, supplied by the Standard Underground Cable Company, of Hamilton, Ontario, will be used on all of the 12,000-volt cables.

All of the three conductor cables referred to are 350,000-C.M., 12,000-volt, paper insulated lead and armor covered.

These cables were ordered from the Eugene Phillips Electric Works, of Montreal, Quebec, after an extensive investigation by the engineers of the Commission including a series of tests made in the Commission's Laboratories upon samples of cable submitted by the leading cable manufacturers. This investigation of power cable covered a study of dielectric power loss, dielectric strength, insulation resistance, electrostatic capacity, action of the cable compound under various temperatures and the tensile strength of a lead sheath when alloyed with a small percentage of tin or antimony.

These studies were deemed necessary on account of the past experience of the Ontario Power Company with paper insulated lead covered power cables installed on the steep grade existing in the cable tunnel between the generating and distributing stations. This tunnel has a length of about 600 feet and a vertical rise of about 250 feet in this length.

## DISTRIBUTING STATION

### Bus Structures and Electrical Equipment

At the distributing station an extension is being made of the present 12,000-volt busses in new bus structures with provision for the installation of power limiting reactors between the new and the old sections. An extensive study of short circuit currents has been made with the object of making the new construction as rugged as will be necessary.

The extension of the busses will accommodate the two new generators and two new large capacity outgoing feeders to the Niagara Transformer Station of the Commission.

The present extension of the bus structures and switch room floor will occupy all of the remaining available space in the north-west corner of the existing building.

Two sets of bus power limiting reactors will be installed in the gallery to be built over the switch room floor in the north-west corner of the station.

A pair of 1,200-ampere, 12,000-volt, type F. form H6, Canadian General Electric Company oil circuit breakers will be installed for each generator as bus selectors.

A large number of 1,200-ampere, 12,000-volt, disconnecting switches and bus bar and cable supports, to be manufactured by the General Devices and Fittings Company, of Chicago, Illinois, were ordered from A. H. Winter-Joyner, Limited, of Toronto, Ontario.

The generator cables for each unit will be bussed together in a cable man-hole outside of the north wall of the distributing station and leads of 1,500,000-c.m., single conductor, varnished cambric and braid covered stranded cable supplied by the Northern Electric Company will be brought through to the circuit breakers inside the station.

On the leads from the generator cables inside the bus room, current and potential transformers will be installed.

One of three sets of current transformers at this point together with the set of current transformers inside of the star point leads in the pit in the generating station floor will be used on a system of differential relay protection which is to include the generator, the generator oil switch and all the generator cables up to the distributing station. In addition overload protection with a high definite time setting of the relays and reverse power protection are to be provided.

Control pedestals, Tirrill regulators and instrument posts for the two new units, similar to those already installed, are provided for the control room. The instrument posts and meters are being supplied by the Canadian Westinghouse Company and the control pedestals and Tirrill regulators by the Canadian General Electric Company. The temperature indicators, to indicate directly the temperature of the generator windings, will be installed on these instrument posts.

Each of the two feeder sections of the new bus extension are to be provided with a pair of 1,600-ampere, 12,000-volt, type C. round tank, reactance, Canadian Westinghouse Company oil circuit breakers. Cables are already being installed for the use of one of these feeder sections and the re-arrangement of existing cables will be made in the near future to enable the use of the other section. The same type of circuit breaker will be used on the new bus reactors.

#### Factory Inspection

Rigid factory inspection was carried on by the Commission's engineers throughout the manufacture and delivery of equipment for this extension in order to check up the manufacturer upon the quality of the material used, class of workmanship and conformation to schedule for shipment. As a result the first generator was delivered complete from the factory by October 31, 1918.

#### Temporary Installation of First Generator

By the latter part of the summer it was evident that if the first generator was delivered on schedule time, it would be possible to make use of it temporarily as a synchronous condenser in order to obtain a higher power factor on the generators now in operation, before the work of the extension was completed to such an extent as to enable the use of the unit as a generator.

Plans were therefore gotten out for the installation of one unit in a temporary pit in the north end of the existing generating station and the temporary generator foundations and installation of the permanent generator cables, control equipment



and exciter equipment were rushed forward so that the unit could be installed as soon as delivered.

The last piece of the first generator being delivered at the generating station on October 31st, the erection of the unit, for operation as a synchronous condenser will be rushed and it is expected that it will be in service in a few weeks.

#### Progress of Work on the Extension

The hydraulic, building and electrical work in connection with this extension is being pushed rapidly forward and it is hoped to have the completed equipment in service in the early months of 1919.

### QUEENSTON-CHIPPEWA DEVELOPMENT

#### Railway Works

The undercrossing of the N.S. & T. Railway involved the diversion of the existing single track to one side of the bridge site and the construction of a double track reinforced concrete arch with 86-foot span, having a rise of 25 feet. This arch was designed for Coopers' E-60 loading, and contained approximately 3,500 cubic yards of concrete and over 90 tons of steel. The depth from base of rail to foundations was 52 feet. Lackawana sheet piling was driven around the abutments, coffer dams were unwatered and material excavated to required depth during the winter of 1918. A great deal of trouble was occasioned with water due to saturation of surrounding subsoil. The concrete in the abutments and arch ring was poured during the summer of 1918, and arch completed and traffic restored to the original alignment in December. A temporary timber trestle was designed to carry the N.S. & T. main line over the construction railway tracks, which are in the canal prism paralleling the centre line of same.

The Wabash Railway main line was diverted on a timber trestle over 40 feet in height, extending across the previously excavated canal section. The excavation of the canal prism thus provided natural drainage for the foundations which are in the course of preparation for the 100-foot reinforced concrete arch to be built. This arch differs in design from that of the N.S. & T. Railway, having straight wing gravity walls instead of the reinforced cantilever type used in that arch. There are approximately 3,000 yards of concrete and 65 tons of reinforcing steel involved in the construction. It is proposed to get all the form work in place during the winter of 1918, and proceed with the concrete work as soon as weather conditions permit. Upon completion the structure will provide for the carrying of two tracks spaced 13 feet centres, which will take care of the immediate requirements of that railway for a great many years to come. The main line tracks of the Wabash are carried over the construction railway by means of a temporary trestle.

A three-track trestle about 400 feet in length has been constructed for the diversion of the main line of the Grand Trunk and branch line of the Michigan Central. When the traffic diversion is effected on these two lines the portion of the arch lying to the north and south of the diverted tracks will be constructed. Upon completion of the outside portions of the arch it is intended to re-divert traffic to the present alignment. The structure at this point consists of a reinforced concrete arch having a span of 72 feet, and rise of 20 feet, and involves the placing of 10,000 cubic yards of concrete and 325 tons of steel. The structure thus built will provide for ten tracks. Owing to the high cost of the diversion of these lines, and the probable need of future extensions, it was decided to carry the arch through



under the M.C.R. and G.T.R., making one continuous structure. In the restoration of the G.T.R. and M.C.R. to the original alignment, a temporary timber trestle will carry tracks over the construction railway undercrossing. The trestles for the diversion and re-location of railway involves the use of over 300,000 feet of timber.

Upon the completion of the three arches above described the construction railway and excavating equipment will be free to move, and the innumerable delays already occasioned will be entirely removed. This will facilitate matters very generally in the pursuit of the work, as the construction railway disposal tracks form a junction with the main line construction railway between the Wabash Railway and M.C.R. and G. T. R. It is thus important that these structures be completed at the earliest possible moment, so as to interfere as little as possible with the output of the excavating equipment.

A number of studies have been made and designs prepared in connection with the other railway and highway bridges which are necessary on the work. Preliminary work has been done in the location of a construction railway connecting the M.C.R. through Queenston with Power House site.

#### **Construction Railway**

During the year the eleven mile double track of construction railway at Niagara has been electrified along with the yards and sidings. A special form of overhead trolley support was designed so as to locate the trolley wire seven feet to one side of the centre line of track, thus leaving a clear overhead above the running rails to enable the locomotive cranes and other similar equipment to operate up and down the tracks without fouling the trolley wire. The Construction Department particularly requested this form of support and reports that it is working very satisfactorily.

The six 500-kw. rotary converters and six Westinghouse locomotive equipments that were ordered in September, 1917, have been delivered and placed in service.

#### **Construction Railway Overhead**

The special features in the overhead work of the construction railway referred to on page 114 of the Tenth Annual Report have been successfully introduced, and the railway has been effectually performing its functions in accordance with proposed schedules.

#### **Generating Station**

The work on the electrical design has been somewhat delayed due to the necessity of concentrating all energies on the extension of the Ontario Power Company's generating station. Engineers of the Commission visited the factories of the Westinghouse Electric and Manufacturing Company, at Pittsburgh, Pennsylvania, and of the General Electric Company, at Schenectady, New York, and at Pittsfield, Massachusetts, to see the progress in development that had been made by these companies in generators, transformers and switching equipment. Studies have been made to determine the best system of connections and the proper high tension voltage to adopt. After thoroughly considering the requirements, specifications were issued in October calling for 45,000-kv-a., 80 per cent. power factor, 12,000-volt, three-phase 25-cycle, 187.5-r.p.m. vertical shaft waterwheel type generators, complete with thrust bearing, two guide bearings, half couplings, exciter, voltage regulator and accessories. The thrust bearing will have to carry the entire weight of generator and turbine rotating parts. As these generators

will be the largest waterwheel units in the world, the specifications were very carefully prepared, particular consideration being given to ventilation, temperature rise, short circuit characteristics and tests. The specifications require the generators to be maximum rated at 45,000-kv-a., with a total maximum temperature of 100°C. with an ambient temperature of 40°C., and with provision for an alternative tender on generators with 110°C. total temperature.

Some architectural studies were made of the generating station building.

#### Whirlpool Distributing Station

The building which was referred to in last Annual Report was completed in December, 1917.

The installation of the electrical equipment by the Commission's Construction Department was started in December, 1917. The first 1,500-kv-a. three-phase transformer was put in service on February 3, 1918, and the station was completed and all in service by June 9th.

Owing to the increasing load for the railway equipment in the Whirlpool Section of the Queenston Development it has been decided to build an extension to Whirlpool Station to accommodate two additional 500-kw., 600-volt rotary converters together with necessary transformer and switching equipment. Plans are now being prepared for the installation of this equipment.

The railway equipment originally ordered for Montrose Distributing Station is to be used in this extension.

The construction work on the extension is to be started in November, 1918, and the installation of the electrical equipment the first part of January, 1919.

#### Montrose Distributing Station

Inspection and tests of the rotary converters and transformers referred to in last Report were made at the manufacturer's factory and all the material for this station was delivered but the construction of the building was postponed. Due to the necessity of immediately increasing the capacity of the direct current railway equipment in the Whirlpool Distributing Station and as there was no immediate demand for power at the Montrose section of the Queenston Development it was decided to install in Whirlpool Station, the two 500-kw., 600-volt rotary converters originally purchased for Montrose station.

To replace this equipment for this station negotiations are under way for the purchase of three 500-kw. rotary converters and the necessary switching equipment.

The building of this station and the installation of the electrical equipment is to be started in the spring of 1919.

## STATION CONSTRUCTION

### NIAGARA SYSTEM

#### General

#### NIAGARA FALLS TRANSFORMER STATION

##### Additional Transformer Equipment

No. 5 bank of transformers which originally consisted of 3,500 kv-a. units were replaced by 7,500 kv-a. units and put into service on December 10th, 1917.

The transformers which were known as No. 4 bank consisting of three 3,500 kv-a. 110,000-volt units were replaced by 7,500 kv-a. units which were placed in service on June 7th, 1918.

The 110,000-volt transformers which were removed from No. 4 bank were reconnected and installed for 46,000-volt operation. This bank of transformers now known as No. 4 bank at 46,000 volts, were placed in service on October 30th, 1918. Plans are now being prepared so that this bank of transformers may be used for 110,000-volt as well as 46,000-volt operation.

The 3,500 kv-a. units which were originally installed in No. 1 bank of 110,000-volt transformers have been replaced by 7,500 kv-a. units. It is expected that these will be put into service during the latter part of December, 1918.

#### Switching Equipment 12,000-volts

The 12,000-volt bus and bus structures for No. 4 bank of 110,000-volt transformers have been altered so as to allow for the installation of the new switching equipment for these transformers, and also for the re-arrangements of No. 4 and spare Ontario Power Company's feeders which supply this bank.

The 12,000-volt bus and bus structures for No. 5 bank of 110,000-volt transformers have been re-arranged so that No. 5, No. 6 and No. 7 "O.P." feeders are connected to one auxiliary bus which supplies these transformers. This arrangement was completed and put into service on June 30th.

The bus structure between No. 4 and No. 5 "O.P." feeders was rebuilt and a 2,000-ampere, 12,000-volt main bus tie-breaker has been installed and was put into service on July 7th. This breaker is used in connection with Set "B" reactors which have been temporarily installed.

The 12,000-volt auxiliary bus structure for No. 1 "O.P." feeder and No. 1 bank of 110,000-volt transformers built in the original installation of this station has been completely removed and a new bus structure built for the new switching equipment. It is expected that this will be completed the latter part of December, 1918.

The plans for the rebuilding of the auxiliary bus structures and necessary changes in the main bus structure for No. 2 and No. 3 "O.P." feeders and 110,000-volt transformer banks are completed and the work of rebuilding these is to be started during January, 1919. All new switching equipment of the latest improved design is to be used in connection with this installation.

The installation of the switching equipment for No. 1 feeder from the Canadian-Niagara Power Company was completed and put into service on January 20th, 1918.

On January 25th No. 1 bank of 46,000-volt transformers were put into service in their permanent location on the "C.N.P." bus.

#### Switching Equipment 110,000-volts

Owing to the increased load on the 110,000-volt lines to Dundas it was found necessary to replace the present line oil switches with switches of greater capacity. A contract was placed with the Canadian Westinghouse Company for two 400-ampere round tank resistance breakers for lines No. 3 and No. 4. Two plain round tank oil breakers ordered on a stock order were allotted to this station for lines No. 1 and No. 2 on which lines they will be installed in series with the present resistance breakers.

The plans for the installation of these breakers have been completed and they are to be installed during the early part of 1919.

In order to improve the operation of the circuit breakers in this station a new storage battery is being installed.



### Protection of Service

As mentioned in last year's Report orders were placed for reactors and the necessary switching equipment in order to limit the effect of short circuits. One set of Metropolitan reactors known as set "A" have been installed between the "O.P." bus and the "C.N.P." bus and were put into service January 31st.

The set of reactors purchased from the Canadian General Electric Company and known as set "B" have been installed temporarily in the middle of the "O.P." bus and were placed in service on July 7, 1918.

Plans are being prepared for the installation of a set of reactors at the opposite end of the "C.N.P." bus to which set "A" reactors are situated and will be connected between this end of the "C.N.P." bus and the middle of the "O.P." bus.

Further studies are being made to reduce the possibilities of damage due to short circuits and to increase the flexibility of the station.

New neutral resistances were designed and built during the summer for both the 110,000-volt and 46,000-volt outgoing lines. Each of these consisted of four wooden tanks 6 feet in diameter and 9 feet deep, connected in series. These are expected to go into service the first week of November, 1918.

A temporary wooden building is being erected to house the neutral resistance tanks for protection against the cold weather. As this type of neutral resistance is more or less of a new departure their operation is to be carefully watched for the next year.

### 12,000-volt Feeders

The remaining two feeders from the Canadian Niagara Power Company known as "C.N.1" and "C.N.4" feeders were put into service in their permanent location on January 26, 1918 and November 25, 1917, respectively.

The installation of No. 12 feeder from the Ontario Power Company was completed and put into service on March 30, 1918.

No. 4 feeder and the spare feeder from the Ontario Power Company were each reinforced with one additional cable which was formerly used on No. 1 "O.P." feeder. These feeders were put into service on May 31st and 28th, respectively.

One additional cable has been installed on No. 2 feeder and one on No. 3 feeder from the Ontario Power Company. This work has been completed and the former feeder was put into service on July 27th and the latter on August 1, 1918.

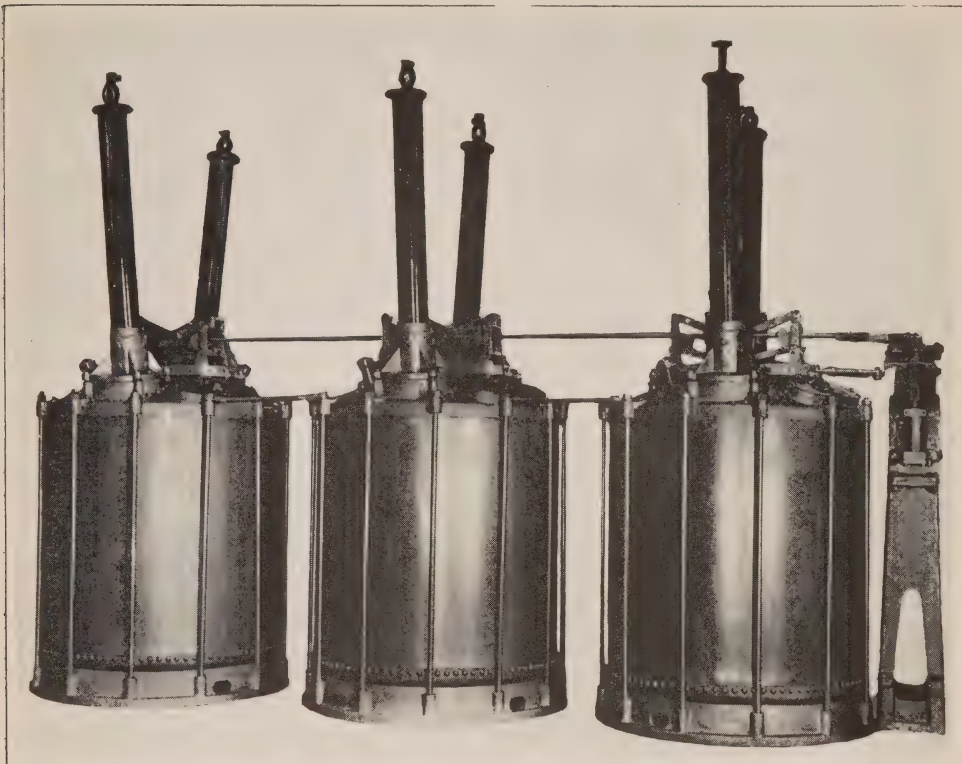
Plans have been completed and the work of installation is well under way for the new No. 1 feeder from the Ontario Power Company. This will consist of four 350,000 C.M. three conductor cables ordered on a stock order from the Standard Underground Cable Company. It is expected that this feeder will be put into service the latter part of December, 1918.

Plans are being prepared in connection with the re-arrangement of the incoming Ontario Power Company feeders in the 1913 building so as to obtain improved operating conditions.

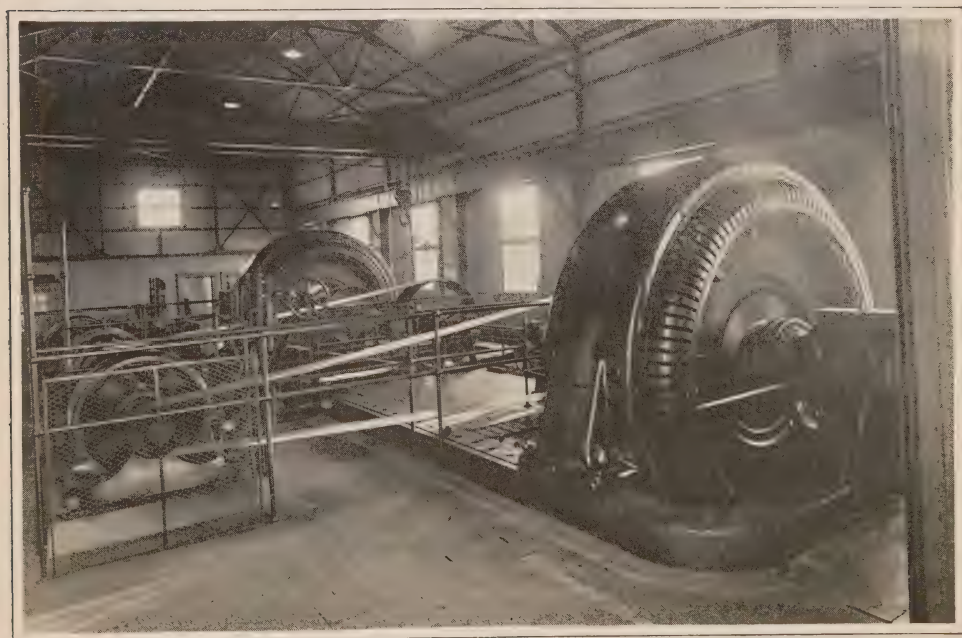
### Switchboard

In order to take care of the additional switching and protective equipment that has been installed a re-arrangement of the switchboard was found necessary. A new layout of the switchboard has been made and the changes are being proceeded with.





400-ampere, 110,000-volt Westinghouse oil circuit breaker, recently installed in Dundas Transformer Station.



4,000-k.v.a., 12,000-volt, 25-cycle synchronous condensers, Toronto Transformer Station.

In order to have more complete records of the total loads on the 46,000 and 110,000-lines, the "C.N.P." and the "O.P." feeders, a complete new totalizing metering equipment is being installed.

#### Water and Oil Systems

The 8,000-gallon oil tank mentioned in last year's Report has been installed and is ready for service.

In order to have a better system for cooling the transformers a new water supply is being installed by pumping water from the Ontario Power Company's pipe line to this station and having a return from this station to the Ontario Power Company's return main at their stand pipe.

#### General

In order to take care of the sewage, plans have been completed for a septic tank and the work of installing same will be completed during the early part of December. The layout of the drainage system around the station has been improved and the work in connection with this is well under way. A new road is being built at the east side of the station adjacent to the 1916 extension.

To facilitate handling of the reactors, an opening was made in the trans-former runway under the crane.

In order to enable the 12,000-volt oil circuit breakers to be readily removed from the switch structures, plans have been prepared for an arrangement so that the breakers in the original station can be removed by means of a 3-ton chain block suspended from the building steel.

Plans have been prepared for the installation of a ventilating system in order to cool the section of the station where set "A" reactors are installed. The installation of this is to be done the first of the year.

### Dundas Transformer Station

#### New Line Oil Switches

The installation of the four Canadian Westinghouse round tank reactance type "GA" 110,000-volt, 400-ampere, oil switches on the four lines entering this station from Niagara Falls, as mentioned in last Report, was completed, the last one being placed in service on September 19th. The switches were installed in position by the Canadian Westinghouse Company but all electrical connections thereto were made by the Commission.

As these switches require a heavy closing current, it was necessary to install new operating leads connecting directly from the main direct current operating busses at the switch board to the oil switch operating coils. A small panel was installed near each switch, on which reverse power relays, magnet switch and a four point relay switch were mounted, the last named being connected to prevent the switch being held closed on overload.

Thermometers were placed on each of these type "GA" oil switch tanks and connected to ring an alarm bell should the temperature reach 50 degrees Centigrade, to warn the operator so the switch could be cut out of service. Special blower motors were also installed on each switch tank connected so that they will operate automatically when the switch opens, expelling the gases from the tank. These blower motors may also be operated with the switches closed, if so desired, by the operator closing an auxiliary switch on the main switchboard, or one on the control panel at the oil switch. Specially designed quick break contacts were also supplied on these switches.

The four Canadian Westinghouse old type "GA" oil switches, replaced by those mentioned above, are stored at Dundas and are to be strengthened and improved and again put in service at some other station.

Due to the heavy service demanded for switch operation it was decided to operate the battery and D.C. generator in parallel "floating" on the busses and a new 10-kw. Canadian Westinghouse motor generator set was purchased to replace the old 5-kw. Canadian Westinghouse motor generator set which was removed and is to be used at Stratford.

It was decided to install electric heaters throughout this station and twenty-four 10-kw. electric heaters were ordered and plans prepared showing their location in the station. Three kv-a., 13,200/2,200/550-volt single phase Packard Electric Company transformers were transferred from Mitchell Station to this station to be used as service transformers to supply power for the heaters and the new motor generator set. These transformers and the motor generator set were installed in a temporary galvanized iron building 15 feet by 15 feet by 11 feet high located outside against the north wall opposite the control room, with a door between it and the control room. These transformers are connected through disconnecting switches to the present 13,200-volt service oil switch leads, in parallel with the old service transformers. The 550-volt leads from these transformers are connected through an automatic oil switch on a new 550-volt service panel installed beside the battery panel in the control room, to four three pole knife switches on this panel controlling the 550-volt feeder circuits. One of these switches connects to the motor generator set, two connect to the electric heater circuits and one is a spare. The installation work is being done by the Commission's Construction Department. It is now nearly completed and it is expected that it will be placed in service in December, 1918.

There is now under consideration a plan to increase the capacity of all the remaining 110,000-volt line oil switches and the No. 1 transformer oil switch by either remodelling the present switches or by obtaining new switches.

Preliminary sketches and estimates have been made for brick walls which it is proposed to build around the high tension oil breakers.

#### Increased Transformer Capacity

The transfer of seven 2,500-kv-a. 110,000-volt transformers from Toronto Transformer Station to this station and installation of these in this station, as mentioned in last Report, has been completed excepting the oil and air piping to the transformers and this is now being installed. The first transformer bank was cut into service on December 17th, 1917, and the second bank on March 10th, 1918. The 13,200-volt leads from these transformers to the 13,200-volt station busses, also the busses, the disconnecting switches and current transformers were increased in size to carry the larger load.

The existing six 1,250-kv-a. transformers were removed from the station and made ready for shipment by the Operating Department.

It was also decided to install the Canadian General Electric type "K-15" 110,000-volt oil switch, mentioned in last Report, on the No. 2 transformer bank feeder, replacing the present Canadian Westinghouse type "GA" oil switch. Plans showing this change have been prepared but the installation work has not been done.

A type "M.D.G. 107" transformer oil drying outfit with a capacity of 20 to 30 gallons of filtered oil per minute, was purchased from the E. J. Hunt Company, New Jersey and has been delivered.



### Transformer Cooling Water Supply

The well mentioned in last year's report, page 121, was completed in May, 1918. The bottom is 17 feet below grade. A 4-inch reinforced concrete floor was built in the well, 6 feet below the top, to support two motor-operated centrifugal pumps. The well is capped with a removable wooden roof covered with galvanized iron. A "scuttle" 2 feet 6 inches square gives access to the pump chamber. Two 4-inch supply pipes, one 6-inch waste pipe, also two 2-inch and one 1½-inch conduit for motor control and lighting circuits were carried into the station and under the basement floor to a point below the piping subway where rivers were installed connecting the supply and waste pipes to the present water system. Cooling water after passing through the transformers can be returned to the well or discharged to the station drain. The supply of water obtained from the well did not come up to expectations, and connections were provided so that an auxiliary intake could be installed to the canal if necessary. Plans are now under way to complete such an installation. One pump was installed in the well and has been supplying cooling water for the transformers since July 31, 1918.

### Toronto Transformer Station

#### Changes to Banks No. 3 and 4

The changes in the switching equipment for transformer banks Nos. 3 and 4 referred to in last Report were made by the Canadian General Electric Company and on June 13th bank No. 4, consisting of three 5,000-kv-a. transformers was placed in service. It is expected that the 5,000-kv-a. transformers will be installed in bank No. 3 in place of the 2,500 kv-a. units and will be ready for service during the next few weeks. The three 2,500-kv-a. transformers from bank No. 4 were removed from the station and are stored outside on timbers immediately to the north of the station and will be used elsewhere when occasion arises. The three 2,500-kv-a. transformers from bank No. 3 will be stored alongside of these when they are replaced by the 5,000-kv-a. units.

In order to accommodate the 5,000-kv-a. transformers, certain changes in the connections of the oil and water piping were necessary and same were carried out by Messrs. Sheppard and Abbott, of Toronto.

#### Changes in Banks No. 1 and 2

The Canadian General Electric Company completed the changes in the 13,200-volt switching equipment, referred to in last Report, and the 5,000-kv-a. transformers were installed in place of the 2,500-kv-a. transformers. No. 1 bank was placed in service on November 12, 1917, and No. 2 bank on January 26, 1918. The six 2,500-kv-a. units together with the spare were removed to Dundas Transformer Station, the first one being shipped on November 7, 1917, and the seventh on April 12, 1918.

New 110,000-volt Canadian General Electric Company's type "K-15" oil circuit breakers were installed by the Construction Department for No. 1 and No. 2 transformer banks. The breaker for No. 1 bank was placed in service on September 5th and the breaker for No. 2 bank on September 16th.



### 1917 Extension for High Tension Line Switch

The 110,000-volt equipment, which was referred to in last Report for the incoming line at the south end of the station, was installed by the Construction Department. This was placed in service on April 25th.

The disconnecting switches in the 110,000-volt bus between transformer banks No. 4 and No. 5, referred to in last Report, were installed and placed in service on February 24th, and the disconnecting switches between No. 2 and No. 3 banks were installed and placed in service on May 13th.

### Increased Carrying Capacity of Incoming Lines

The current carrying parts of the two Westinghouse 110,000 type "GA" oil circuit breakers and of the twelve General Electric disconnecting switches on the incoming lines were changed from 200-ampere capacity to 400-ampere capacity by the Construction Department. These changes were completed and ready for service on one line on September 29th, and on the other line on October 18th.

The 200-ampere current carrying parts of the General Electric 110,000-volt bus tie disconnecting switches between No. 1 and No. 2 transformer banks were replaced by 400-ampere current carrying parts on October 13th.

### Cooling Water Supply

Due to the work being carried on by the Toronto Harbor Commission, it was necessary to cease using the old pumping system in December, 1917, and to obtain the cooling water for the transformers from the City waterworks system. The erection of a new pumphouse is being considered and sketches of this pumphouse have been made up to be submitted to the Toronto Harbor Commission for approval.

### Toronto Synchronous Condenser Station

A steel frame building covered with galvanized corrugated iron sheets, 91 feet, 6 inches long and 34 feet wide, outside dimensions, and with a height of 20 feet, 6 inches from the floor to the bottom of the roof trusses, was constructed immediately to the west of the transformer station. Sixty feet of this building is used for accommodating the synchronous condensers with their auxiliary equipment. Thirty feet was partitioned off into two rooms, each 30 by 16 feet approximately, which is used for the purpose of storing equipment by the Construction Department of either the Commission or a manufacturer while they are installing equipment at Toronto stations. The superstructure of this building was supplied by McGregor & McIntyre Company, Limited, of Toronto.

The building is so constructed that same can be dismantled and removed elsewhere quite easily and with minimum destruction of material. A travelling crane of 20 tons capacity with a 5-ton auxiliary hoist, running the full length of building, was supplied by The Herbert Morris Crane & Hoist Company. The excavation work for the concrete foundations was commenced in November, 1917.

Two 4,000-kv-a. 13,200-volt, 3-phase, 25-cycle, ten-pole, 300-r.p.m. revolving field type Stanley Electric Company's generators were purchased from H. U. Roeding & Company, of San Francisco, California, for use as synchronous condensers. One 100-horse-power type "M.W.", 4-pole, 720-r.p.m., 220-volt, 25-cycle, 3-phase, wound rotor, variable speed Canadian Westinghouse Company induction motor with drum controller and resistance was purchased on December 15th from The Larkin Company, of Buffalo, to be used for starting the above condensers.

Two 55-kw., Form "H," 118-125-volt, 925-r.p.m., D.C. generators were purchased from the Almonte Electric Light Commission, Almonte, Ontario, to be used as exciters for the above synchronous condensers. One 1,000-pound, high pressure oil pump was purchased from Wm. R. Perrin and Company, of Toronto, to relieve the bearing pressure on the synchronous condensers when starting. The necessary shafting, couplings, clutches, pulleys, belts, etc., for starting the synchronous condensers were purchased from the Dodge Manufacturing Company on December 29th for delivery in January. The necessary lead covered cable was purchased from Eugene F. Phillips Electric Works, of Montreal. Most of the necessary instruments, instrument transformers, etc., were purchased from the Canadian General Electric Company for installation on existing panels in the Transformer Station. Each condenser was connected to the 13,200-volt busses in Toronto Station through Canadian General Electric "H-3" oil switches, disconnecting switches, etc., installed by the Toronto Hydro-Electric System. The relay protection on these condensers consist of Condit Type "A" inverse definite time overload relays together with General Electric Type "P" differential relays.

All the above equipment together with the lubricating system, lighting, etc., except that mentioned was installed by the Commission. No. 1 condenser was placed in service on June 16th. The insulation of armature coils for No. 2 condenser having been found to be in poor condition, these coils were re-insulated by the Canadian General Electric Company in Peterboro. While the armature was being re-wound, 4 embedded temperature detectors were installed with the armature coils. It is proposed to purchase 4 more temperature detectors for No. 1 condenser and also the necessary temperature indicator and switches for both condensers. It is expected that No. 2 condenser will be placed in service during November.

### London Transformer Station

Nine sets of Condit type "A" relays will be supplied for this station, being taken from a stock order placed in December, 1917, with the Northern Electric Company. These relays will be installed on the seven 13,200-volt feeders and two transformer low tension circuits replacing the existing General Electric Type "P" relays.

### Guelph Transformer Station

It was decided to replace the "K-12" oil breaker in the transformer low tension circuit with a new breaker of considerably higher arc rupturing capacity. This new breaker which is type "GA-3" is being supplied from a stock order placed previously with the Canadian Westinghouse Company and it is expected that same will be installed early in 1919. It was also decided to replace the type "P" General Electric relays for this transformer circuit with Condit relays purchased on a stock order from the Northern Electric Company and at the same time to supply Condit relays to replace the type "P" relays on the five 13,200 volt feeders. These Condit relays will be arranged to operate in selective progression so that improved conditions will be obtained as a result of these changes.

A 12-volt storage battery has been ordered from the Canadian Hart Accumulator Company and will be installed to trip the 13,200-volt feeder and transformer circuit breakers.

The three 750-kv-a. Canadian Westinghouse Company's transformers together with the spare transformer were replaced on January 17th with four 1,250-kv-a. General Electric Company's transformers from Dundas Transformer

Station. The four 750-kv-a. transformers are stored outside the station, pending their transfer to other stations. The changes in switching equipment will be carried out by the Operating Department's maintenance force, who also did the work of changing the transformers.

### Preston Transformer Station

Work was continued on the electrical installation described in last Report. The second bank of transformers was moved from the temporary position in the track runway, into the transformer pockets and connected to the 110,000-volt busses through disconnecting switches, choke coils and an oil switch transferred from Stratford. This bank was placed in service on June 4, 1918. The low tension side of this transformer bank was left at 6,600-volts and connected through a new Canadian Westinghouse type "C" oil switch to the old 6,600-volt bus in parallel with bank No. 1 temporarily.

In August it was decided to leave the Preston sub-station, the Hespeler sub-station, and the Galt, Preston and Hespeler Railway sub-station at 6,600 volts for the present. Galt sub-station will, however, be fed at 13,200 volts and Breslau at 4,000 volts. To accomplish this the layout plans were changed and instructions were issued to have all the 6,600-volt feeders mentioned above fed from transformer bank No. 1, through the old 6,600-volt busses and switching equipment in the old section of the station and controlled from the present switchboard in the old control room.

The two 13,200-volt Galt feeders, and the Breslau feeder will be fed from transformer bank No. 2 through new 13,200-volt busses, oil switches and equipment installed in the new section of the station and electrically controlled from the switchboard in the new control room. The new service transformers are also to operate off transformer bank No. 2 with an emergency 110-volt lighting connection from the present service transformers.

A 6,600-volt emergency connection was made from the half voltage taps on transformer bank No. 2 through one of the old Galt feeder switches to the old 6,600-volt busses, to be used in case of failure No. 1 transformer bank.

Due to changes mentioned above this installation was not completed as expected, but it is now almost completed and it is now expected to connect Galt feeders in at 13,200 volts early in 1919.

When these changes are completed the remaining work will be held up until all the stations fed from this station are changed from 6,600 volts to 13,200 volts and then the installation will be completed as originally designed.

### Transformer Cooling Water Supply

Last year's report, page 124, mentioned the drilling of an 8-inch well to a depth of about 130 feet. A second 8-inch flowing well was secured by drilling in the old sub-grade pump house to a depth of about 138 feet. The measured flow from this well was about 220 gallons per minute. This well has been plugged. As soon as a suitable pump can be released from other work the two wells will be permanently piped into the basement to supply the two present pumps and the third one to the new pump mentioned above. Header piping will be arranged so that all the pumps can take their supply from either well and so that both wells can be pumped at the same time.



### Kitchener Transformer Station

Arrangements have been made to install the three 5-kv-a., 13,200-volt primary, 230/115-volt secondary station service transformers, removed from Stratford Transformer Station, in parallel on the primary side with the existing service transformers, in order to supply 220-volt, 3-phase power for the deep well pump referred to in last Report.

### Transformer Cooling Water Supply

The sub-grade pump house and equipment mentioned in last year's report, page 124, is in place. It is expected that the new equipment will be in operation shortly. The emergency connection to the city mains has been held over until a more favorable price can be secured on the necessary W.I. main.

### Stratford Transformer Station

The two three-phase, 75-kv-a. station service transformers referred to in last Report were tested and shipped from the factory of the Canadian General Electric Company in February and were installed temporarily in this station to provide lighting, and power for pumps, etc., after the low tension voltage of the station was changed from 13,200 volts to 26,400 volts. This change in the voltage was made on April 14th.

Practically all the necessary equipment has been purchased for changing the existing 110,000-volt and 26,400-volt switches from hand to electrical operation, and to install one additional 26,400-volt feeder. Arrangements have been made to transfer one type "E-7" storage battery from Niagara Station and one 5-kw., 125-volt motor generator set from Dundas Station for charging the battery. The drawings are practically all completed for the installation of the above equipment and for changes required to move the switchboard to the service room and for the permanent installation of the 75 kv-a. service transformers. It is expected that the construction work will be proceeded with early in 1919.

The 110,000-volt switching equipment, referred to in last Report, for the original 750 kv-a. transformers was removed to Preston Transformer Station during the month of January.

### Transformer Cooling Water Supply

A well about 30 feet from the north wall of the station was drilled to a depth of 140 feet. This well tested about 80 gallons per minute with the water standing about 20 feet below the surface. A motor operated deep well pump will be placed in a sub-grade pump house directly over the well and piping connections made to the existing piping in the basement of the station.

### Woodstock Transformer Station

Owing to the increased load on the Norwich and Tillsonburg feeders which were being fed through one oil breaker and also because the power was measured on one set of meters in the Woodstock Transformer Station, the installation of a separate oil breaker and separate metering equipment for the Tillsonburg feeder was decided upon in June and plans showing the changes were prepared. Due to the long and uncertain delivery of new apparatus, the equipment required for this change, except the current transformers, is being obtained from spare equipment in the Preston and Guelph Transformer Station and also from the Etobicoke temporary Distributing Station which is being dismantled. The current



transformers are being ordered from the Canadian Westinghouse Company. The installation will be made by the Commission's Construction Department and will be completed early in 1919.

As this station is located close to a large public park, it was decided to erect fences around the 110,000-volt lightning arrester horn gap structure. A strong 6-foot chain link fence has been ordered from the Page Wire and Fence Company for this purpose and will be erected by the Commission's Construction Department when installing the equipment mentioned above.

### **St. Thomas Transformer Station**

The installation of the two 13,200-volt feeders mentioned in last year's Report was completed, one being placed in service on April 14th and the other on September 29th, 1918.

#### **Transformer Cooling Water Supply**

The drilling of an 8-inch well about 40 feet west of the station and about 10 feet north of the cooling pond is under contract and will be undertaken at an early date.

### **Cooksville Transformer Station**

The increase of the load on the high tension lines running through this station to Toronto during the summer of this year has made it necessary to increase the carrying capacity of the disconnecting switches and oil circuit breakers from 200 to 400 amperes. The necessary parts for this change were ordered from the Canadian Westinghouse Company in October, 1918, and will be delivered and ready for installation in February, 1919. A stronger Ohio Brass Company pillar insulator is also being supplied for the disconnecting switches.

#### **Frequency Changer Set**

The 1,000 kv-a. frequency changer set and equipment described in last Annual Report, was installed at the Cooksville Transformer Station in a corrugated sheet steel annex. This equipment went into service in December, 1917.

Power is being taken from one 13,200-volt, 60-cycle line from the former Erindale Power Company's station which was purchased by the Commission, and this power was to be fed direct at 13,200 volts, 25-cycles, into the Niagara System on the Cooksville Station 13,200-volt bus. It was later decided to reconnect the 25-cycle end of this set for 2,300 volts and to feed power into the Cooksville 13,200-volt bus through a bank of transformers. Three 300-kv-a. oil insulated, self-cooled Johnston and Phillips transformers, single phase, 25-cycle, 13,200, 12,800 and 12,230 volts primary and 2,300-volt secondary were moved from London Municipal Station and installed at Cooksville for stepping up from generator voltage at 2,300 volts to the Cooksville bus voltage. This bank was installed in a corrugated iron building erected beside the frequency changer set annex. Water cooling of this bank was obtained by spraying water on the sides of the tanks.

### **Brant Transformer Station**

The changes in the above station, as outlined in the last Report, are almost completed. The equipment with the exception of the differential relay protection on the 1,250-kv-a. 63,500/26,400-volt transformers, will be placed in service in

November, 1918. The installation of the latter has been delayed awaiting the supply of air insulated 66,000-volt current transformers being designed and manufactured by the Commission.

Some preliminary sketches and estimates were made for an extension to this station for a second transformer bank with necessary switching equipment, which it is proposed to install to take care of additional loads expected in the near future.

#### **Transformer Cooling Water Supply**

The dug well in the basement is 55 feet deep and has not during the past year been supplying sufficient water. A 6-inch casing was driven to a depth of 18 feet below the bottom of the dug well, the lower part of the casing being perforated and protected by a special screen so as to exclude sand as far as possible. The working barrel of the deep well pump was lowered into this casing. Trouble was experienced with sand blocking the valves of the working barrel to such an extent that it became necessary to raise this working barrel about five feet.

A new well was drilled to a depth of 335 feet on the west side of the station close to the cooling pond. A test of this well showed about 50 gallons per minute available. The placing of an order for the deep well pump, construction of a sub-grade pump house, etc., will be held over until the spring of 1919.

#### **Kent Transformer Station**

On account of the small clearances between the 26,400-volt feeder leads in this station, it was decided to place asbestos barriers between the various feeders to make it safer for the operator to work on one feeder with the adjacent feeder alive. Plans are being prepared showing the necessary barriers and screens and it is expected that this work will be completed early in 1919.

#### **Essex Transformer Station**

##### **Observation Platform**

In the north end of the station a doorway was cut in the wall of the control room and a door put in, opening on to an outside platform 2 feet six inches by 3 feet. This was done for the purpose of better ventilation of the control room in the summer and of providing an easy way for the operator to observe weather conditions.

##### **1918 Additional 26,400-volt Feeder**

In order to supply the Essex County System from this station it is necessary to install an additional 26,400-volt feeder equipment. The oil circuit breakers and current transformers have been ordered for this feeder from the Canadian Westinghouse Company from one of the stock orders. The order was placed also with the Canadian Westinghouse Company on September 21st for necessary connecting material, insulators, panels, etc., which are due for shipment on January 2nd, 1919.

All this equipment together with the line entrances including hoods, insulators and brackets will be installed by the Commission's Construction Department.

#### **York Transformer Station**

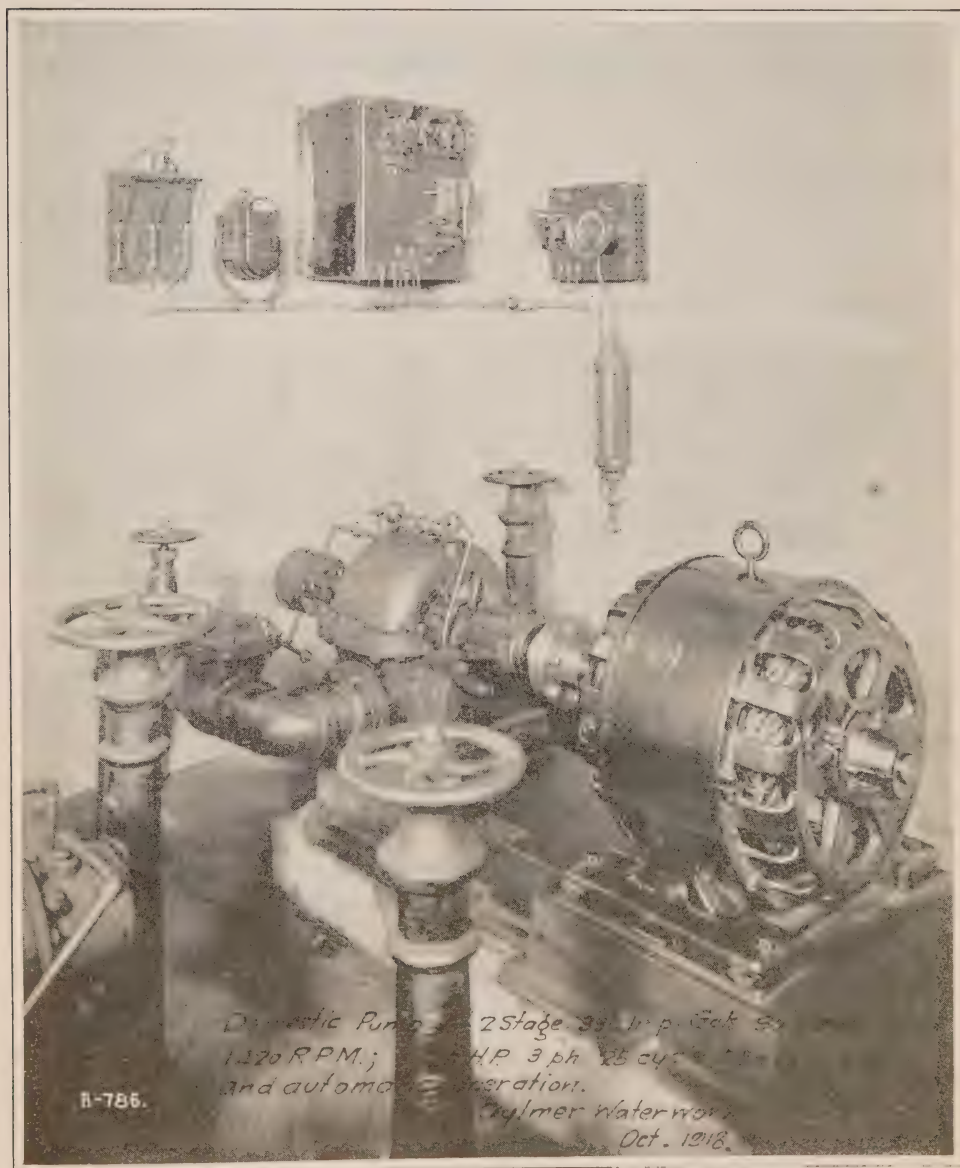
The work on York Transformer Station building design and electrical layout mentioned in last Report was held up indefinitely in January on account of the war conditions.

## NIAGARA SYSTEM

### MUNICIPAL WORK

During the year engineering assistance was given to the following municipalities:

Acton, Ailsa Craig, Ayr, Baden, Blenheim, Bothwell, Brampton, Burford, Caledonia, Comber, Dashwood, Dorchester, Dublin, Dundas, Elora, Exeter, Fergus, Forest, Georgetown, Granton, Hagersville, Harriston, Listowel, Lucan, Lynden, Milton, Milverton, Mimico, New Hamburg, Palmerston, Petrolia, Port Credit, Port Dalhousie, Plattsville, Princeton, Ridgetown, Rockwood, Simcoe, Strathroy, Tavistock, Thamesville, Tilbury, Toronto, Waterford, Watford, Waterdown, Waterloo, Wellesley, Weston, Woodbridge, Woodstock, Wyoming, Zurich.





### Aylmer

During the first part of the year the installation of the distribution system by the local Public Utilities Commission was completed under the supervision of this Commission and restricted power given in March to the local system.

The Commission, at the request of the municipality, took charge of the engineering and purchasing of the equipment for the electrical distribution system. Assistance was also given from time to time on several power extensions and on the operation of the local system, as well as power customers' installations.

#### Municipal Waterworks Pumping

The electrically-driven domestic pump with pressure type automatic control, and the gasoline engine-driven fire pump described in last year's report, page 127, were put in operation in October, 1918. The remaining steam fire pump will probably be replaced by an electrically-driven fire pump at a future date.

#### Distributing Station

As outlined in last Annual Report, plans were prepared and material ordered for the re-arranging of the south-west corner of the Aylmer Electrical and waterworks Station for the installation of electrical equipment. This work of reconstruction of the building was completed by Messrs. Wells and Gray in October, 1917.

This station is fed by one 13,200-volt line from St. Thomas Transformer Station, and steps down to 4,000 volts for service to the Town of Aylmer. Three 50-kv-a. General Electric Company's 13,200/2,300-volt, single-phase transformers were purchased from the St. Thomas Waterworks Commission in December, 1917, and installed, with a delta star connection, to supply this service.

Switching and metering equipment of Siemen's manufacture was transferred from the old Beachville Distributing Station and installed in this Aylmer Station.

Electrical equipment for the 4,000-volt feeder supply to Springfield, comprising a panel, switching and metering equipment, was purchased from the Canadian Westinghouse Company.

The electrical installation was made by the Commission and completed in February, 1918.

### Beachville

At the request of the American Cyanamide Company, estimates were prepared *re* serving them with 150 horse-power at the start to handle their Centreville quarry. The company proposes taking the power at 13,200 volts when available in April of the coming year, and is now preparing plans for the erection of a substation to take 13,200-volt power.

#### Distributing Station

Minor changes in the metering and the relay protection of the equipment were carried out at the Beachville White Lime Distributing Station during the year.



### Blyth—See Brussels

#### Brussels

Considerable work has been done by the engineering staff in order to secure a supply of power for Blyth, Brussels, Wingham, Lucknow, Teeswater, and the surrounding district at a price which would favourably compare with other municipalities. For this reason estimates have been prepared based on a line from the Niagara system, and also providing the Saugeen River could be developed. Due to the unsettled conditions and to the shortage of power, these estimates have not been submitted to the municipalities, but it is hoped that during the coming year service will be given.

#### Bolton

Assistance was given this municipality in arranging for service to a number of rural customers supplied from the Woodbridge-Bolton 4,000-volt line.

#### Brantford

During the year arrangements were made with the municipality to supply power to Brantford Township. Power will be supplied at three different points at the city boundaries to supply power in the township adjacent to the city limits.

Assistance was given Brantford during the year in connection with operating difficulties *re* supply of power to munition plants.

#### Brantford Township

An agreement whereby the Township of Brantford receive their supply of power from the city of Brantford was signed during the year and power was first supplied in September.

Construction work in connection with the system was proceeded with throughout the year and customers formerly supplied from the Western Counties Electric Company were connected to the new township system.

#### Brigden

The new distribution system for the municipality was completed during the year. Arrangements were also made to supply power for a flour mill in the municipality.

#### Distributing Station

In July arrangements were made to change the low tension voltage in this station from 4,000-volts star to 575 volts delta. For this change, new fuses, lightning arresters and instrument transformers were supplied and the change-over to 575-volts was made on September 5th, 1918.

#### Burford

##### Distributing Station

In this station there are three 75-kv-a., single-phase, Canadian Westinghouse Company transformers which are lightly loaded. When 25-cycle transformers were to be supplied for Kingsville Distributing Station it was decided to use the transformers from Burford Distributing Station and purchase a 75-kv-a., 3-phase transformer to replace them. On August 21st an order was placed with the Moloney

Electric Company for one 75-kv-a., 26,400 and 13,200-volt primary, 2,300-volt secondary, 25-cycle, 3-phase, oil-insulated, self-cooled, outdoor type transformer for this station.

#### Chatham

Engineering assistance was given to the municipality during the year in connection with best arrangements for supplying munition plants and additional power customers.

#### Drayton

During the year the distribution system was completed and power turned on. In addition to the lighting load there were two power customers making a peak load of approximately 70 horse-power.

#### Dresden

Engineering assistance was given to Dresden and arrangements made to supply power to a flour mill in the municipality; also general assistance in connection with the operation of the system.

#### Drumbo

Extensions were made east of Drumbo to serve the Wolverton Milling Company, Limited, with 125 horse-power, 550-volt power. A  $7\frac{1}{2}$  kv.a. transformer was added to the bank and two  $7\frac{1}{2}$  kv.a. to give additional capacity for the local chopping mill. The whole distribution system was overhauled and necessary tree trimming carried out for the village. Assistance was given the municipality during the year in the operation of its system.

#### Dunnville

The remodelling of the local distribution system was completed in this town. Hydro power was first used on the Dunnville System on May 23, 1918, power being supplied over a 46,000-volt line from Welland.

#### Municipal Station

The three 150-kv-a. transformers and the switching equipment referred to in last year's Report were installed by the Canadian General Electric Company and the Canadian Westinghouse Company respectively, and the station was tested out and placed in service on May 21st.

The street lighting transformers and their switching equipment which were supplied by the Canadian General Electric Company and installed by the Commission's Construction Department, were also placed in service on May 21st.

#### Street Lighting

An ornamental system with underground cable was installed in this municipality. Twenty-seven cast iron lighting standards with 400-watt series gas filled incandescent lamps enclosed in bowl-band refractors were located in the business district.

#### Dutton

At the request of the manager of the local system estimates were prepared on the cost of using electric power at the local flour and chopping mill and forwarded

to Dutton; contracts were obtained by the local system to supply the mill and two rural customers just outside the municipality in the Township of Dunwich. The Commission, as per resolution of the council, purchased the material for the extensions and supervised the installations.

#### East Flamboro Township

To be in a position to serve additional customers a contract was signed on August 6th with East Flamboro Township covering a supply of electrical energy to that municipality.

To provide for the operation of the distribution system in the Township a form of agreement was drawn up and forwarded covering the operation by the Village of Waterdown of this system.

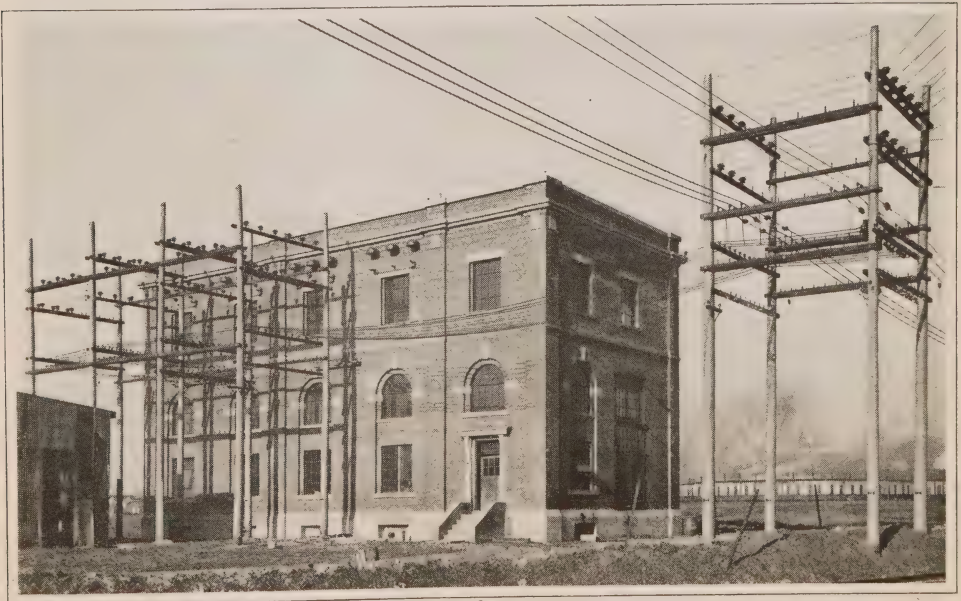
#### Embro

At the request of the management of the local system, equipment was ordered and installed to take care of the City Dairy Company's power load. At the same time the distribution system was overhauled and all necessary tree trimming done and other repairs made to the system to place it in better condition.

#### Etobicoke Township

The work of rebuilding lines in Etobicoke Township was completed and on July 1st the system was turned over to the township.

As sections of this system had been operated by other municipalities, a great amount of work by the municipal department was necessary in checking statements of cost of numerous small additions to lines and equipment which had been made by these municipalities. All such items were carefully checked and adjustments made that were equitable to all concerned.



View of Etobicoke Distributing Station from the southeast.



Two 55-kw., Form "H," 118-125-volt, 925-r.p.m., D.C. generators were purchased from the Almonte Electric Light Commission, Almonte, Ontario, to be used as exciters for the above synchronous condensers. One 1,000-pound, high pressure oil pump was purchased from Wm. R. Perrin and Company, of Toronto, to relieve the bearing pressure on the synchronous condensers when starting. The necessary shafting, couplings, clutches, pulleys, belts, etc., for starting the synchronous condensers were purchased from the Dodge Manufacturing Company on December 29th for delivery in January. The necessary lead covered cable was purchased from Eugene F. Phillips Electric Works, of Montreal. Most of the necessary instruments, instrument transformers, etc., were purchased from the Canadian General Electric Company for installation on existing panels in the Transformer Station. Each condenser was connected to the 13,200-volt busses in Toronto Station through Canadian General Electric "H-3" oil switches, disconnecting switches, etc., installed by the Toronto Hydro-Electric System. The relay protection on these condensers consist of Condit Type "A" inverse definite time overload relays together with General Electric Type "P" differential relays.

All the above equipment together with the lubricating system, lighting, etc., except that mentioned was installed by the Commission. No. 1 condenser was placed in service on June 16th. The insulation of armature coils for No. 2 condenser having been found to be in poor condition, these coils were re-insulated by the Canadian General Electric Company in Peterboro. While the armature was being re-wound, 4 embedded temperature detectors were installed with the armature coils. It is proposed to purchase 4 more temperature detectors for No. 1 condenser and also the necessary temperature indicator and switches for both condensers. It is expected that No. 2 condenser will be placed in service during November.

### London Transformer Station

Nine sets of Condit type "A" relays will be supplied for this station, being taken from a stock order placed in December, 1917, with the Northern Electric Company. These relays will be installed on the seven 13,200-volt feeders and two transformer low tension circuits replacing the existing General Electric Type "P" relays.

### Guelph Transformer Station

It was decided to replace the "K-12" oil breaker in the transformer low tension circuit with a new breaker of considerably higher rupturing capacity. This new breaker which is type "GA-3" is being supplied from a stock order placed previously with the Canadian Westinghouse Company and it is expected that same will be installed early in 1919. It was also decided to replace the type "P" General Electric relays for this transformer circuit with Condit relays purchased on a stock order from the Northern Electric Company and at the same time to supply Condit relays to replace the type "P" relays on the five 13,200 volt feeders. These Condit relays will be arranged to operate in selective progression so that improved conditions will be obtained as a result of these changes.

A 12-volt storage battery has been ordered from the Canadian Hart Accumulator Company and will be installed to trip the 13,200-volt feeder and transformer circuit breakers.

The three 750-kv-a. Canadian Westinghouse Company's transformers together with the spare transformer were replaced on January 17th with four 1,250-kv-a. General Electric Company's transformers from Dundas Transformer



Station. The four 750-kv-a. transformers are stored outside the station, pending their transfer to other stations. The changes in switching equipment will be carried out by the Operating Department's maintenance force, who also did the work of changing the transformers.

### Preston Transformer Station

Work was continued on the electrical installation described in last Report. The second bank of transformers was moved from the temporary position in the track runway, into the transformer pockets and connected to the 110,000-volt busses through disconnecting switches, choke coils and an oil switch transferred from Stratford. This bank was placed in service on June 4, 1918. The low tension side of this transformer bank was left at 6,600-volts and connected through a new Canadian Westinghouse type "C" oil switch to the old 6,600-volt bus in parallel with bank No. 1 temporarily.

In August it was decided to leave the Preston sub-station, the Hespeler sub-station, and the Galt, Preston and Hespeler Railway sub-station at 6,600 volts for the present. Galt sub-station will, however, be fed at 13,200 volts and Breslau at 4,000 volts. To accomplish this the layout plans were changed and instructions were issued to have all the 6,600-volt feeders mentioned above fed from transformer bank No. 1, through the old 6,600-volt busses and switching equipment in the old section of the station and controlled from the present switchboard in the old control room.

The two 13,200-volt Galt feeders, and the Breslau feeder will be fed from transformer bank No. 2 through new 13,200-volt busses, oil switches and equipment installed in the new section of the station and electrically controlled from the switchboard in the new control room. The new service transformers are also to operate off transformer bank No. 2 with an emergency 110-volt lighting connection from the present service transformers.

A 6,600-volt emergency connection was made from the half voltage taps on transformer bank No. 2 through one of the old Galt feeder switches to the old 6,600-volt busses, to be used in case of failure No. 1 transformer bank.

Due to changes mentioned above this installation was not completed as expected, but it is now almost completed and it is now expected to connect Galt feeders in at 13,200 volts early in 1919.

When these changes are completed the remaining work will be held up until all the stations fed from this station are changed from 6,600 volts to 13,200 volts and then the installation will be completed as originally designed.

### Transformer Cooling Water Supply

Last year's report, page 124, mentioned the drilling of an 8-inch well to a depth of about 130 feet. A second 8-inch flowing well was secured by drilling in the old sub-grade pump house to a depth of about 138 feet. The measured flow from this well was about 220 gallons per minute. This well has been plugged. As soon as a suitable pump can be released from other work the two wells will be permanently piped into the basement to supply the two present pumps and the third one to the new pump mentioned above. Header piping will be arranged so that all the pumps can take their supply from either well and so that both wells can be pumped at the same time.

in to service on September 22, 1918. It was, therefore, decided to bring a 13,200-volt feeder out of the station to feed Mimico and plans were prepared showing this new feeder equipment. The 13,200-volt busses in the station were extended and the new feeder connected to the busses through General Electric disconnecting switches and a type "K-2" hand-operated automatic oil switch and relays and Commission's choke coils all of which were obtained from the Etobicoke temporary station. Two Canadian General Electric 60/5-ampere current transformers for this feeder were obtained from Mimico station. All the equipment is located in the high tension room on the third floor. The oil switch operating handle and a double pole series trip relay are mounted on a small panel near the switch. A small auxiliary knife switch on this oil switch is connected to ring an alarm bell in the control room when the switch trips out automatically and so notify the operator in charge.

This work is being done by the Commission and will be completed and put in service in November, 1918.

### Galt

During the year data were collected on the water power situation at Galt in order to ascertain the advisability of developing the same. It is not expected, however, that any action can be taken in connection with this matter as the costs of this development would be greater than the present cost of purchased power by the municipality.

Data have been collected regarding the requirements to change over to 13,200 volts and it is expected that the same will be carried out in February of the coming year and three new 750-kv.a. 13,200/2,300-volt water cooled, three-phase transformers will be installed.

The Commission recommended against proceeding with the new main substation until material prices became more normal.

### Goderich

Additional power was allotted to Goderich to take care of munition loads, etc. Assistance was given in the purchasing of new equipment and general operating.

### Municipal Waterworks Pumping

The electrically-driven pump mentioned in the 1915 report, page 124, failed to meet its guarantees. Satisfactory arrangements were made with the manufacturer whereby the municipality was protected from loss, and in April, 1918, an order was placed with the Storey Pump and Equipment Company for a 6-inch, 4-stage pump, to deliver 700 gallons against a total head of 358 feet.

### Guelph

Assistance was given this municipality in arranging for an increased power supply to customers.

### Municipal Station

The 550-kv.a. and 225-kv.a. transformers referred to in last Report were tested by the Commission's engineer at the Canadian General Electric Company's factory in June. These transformers were installed by the Canadian General Electric Company and placed in service by the Board of Light and Heat Commissioners of Guelph.

At the request of the Board of Light and Heat Commissioners of Guelph, switching equipment for one Type "E" Station was purchased. The station is to be built and the equipment installed by them.

#### **Municipal Waterworks Pumping**

After examination of the present pumping plant a report has been made to the municipality having in view a complete electrically-operated station replacing ultimately the present steam plant. The city desired to locate a railway unit which they now possess in the pumping station, which unit consists of a 550-kv.a. synchronous motor coupled to a d.c. railway generator at one end and an a.c. generator at the other end. The latter generator is to be removed, and the necessary changes made to accommodate a turbine pump of 2,100 g.p.m. capacity. As the speed is only 750 r.p.m. a special multistage pump has to be provided for domestic pressure, and a booster inserted in a bypass for fire pressure.

Other units of 750 and 1,350 g.p.m. capacities, direct driven by electric motors, are provided for domestic service with a second booster for fire pressure, this addition to be made when found desirable.

A future installation of a 2,100 g.p.m. domestic unit and booster will complete the station and allow the steam plant to be shut down entirely, provided that two independent transmission lines serve the station. An alternative for the final installation would be gasoline-driven units for fire service only.

#### **Hamilton**

A number of investigations were made in connection with munition loads in the municipality and also the method of operating the waterworks' loads so that the maximum amount of power could be secured for munition plants.

#### **Highgate**

Arrangements were made whereby power was supplied to the grist mill in the municipality; also engineering assistance in connection with the operation of the system.

#### **Hensall**

Assistance was given the local system with the necessary power extension to serve the Milling Company with approximately 100 horse-power.

From time to time engineering advice has been given in connection with metering power customers' loads and other matters of operation.

#### **Hespeler**

Several matters, such as billing waterworks for electric equipment used for fire purposes and electric power for domestic and fire supply, keeping down the load and operation were taken up with the local management during the year.

In the near future Hespeler, in conjunction with Preston and Galt, will arrange to receive power at 13,200 volts instead of 6,600 volts as at present.

#### **Ingersoll**

Assistance was given the local management during the year in matters pertaining to operation, billing power customers with low power factor and changes to system.

Several additions are expected to be made in the coming year when more power is available, including approximately 200 horse-power in the old Noxon building.

These extra power additions will fully load the substation transformers.

### Kitchener

Although the supply of power was limited, additional station equipment was installed in order to have duplicate apparatus at the present time and more capacity for the future. A new bank of 500 kw. station transformers were purchased and a new 250 kw. rotary converter for the street railway department.

### London

On account of the large demands for power for the manufacture of war munitions, the allotted power to the London Public Utilities Commission was considerably smaller than its requirements, and it was necessary to obtain the co-operation of all power users to keep the demand below the allowable limit.

A number of suburban customers in the Township of London who had received service from the London Electric Company petitioned the London Township Council and it was decided to take over the company's distribution system in part and remodel and add to the same in order to handle the petitioners. The by-laws to carry this out will be voted on at the coming annual elections the first of 1919.

It is proposed to have the London Public Utilities Commission operate the system for the township, it to bill and collect from the suburban customers monthly and to maintain the system in good operating condition and to pay annually the debenture charges and set aside the necessary depreciation reserve.

### Municipal Station

The two 1,500-kv-a., 3-phase transformers referred to in last Report were tested by the Commission's engineer at the Canadian General Electric Company's factory on November 23, 1917, and were shipped from Peterborough on December 1st. These transformers were installed temporarily in the present station by the Public Utilities Commission of London.

The erection of the extension to the building, which it was stated in last Report would be started in 1918, was postponed until the spring of 1919. However, the contract for the switching equipment was placed with the Canadian Westinghouse Company in January for delivery early in 1919.

### Markham

An engineer visited this municipality and prepared plans for alterations to the local distribution system to make it suitable for the supply of energy from Niagara.

### Mitchell

The installation of three 75-kv-a., 26,400-volt transformers and switching equipment, referred to in last year's Report, was completed on November 27, 1917 and the station was placed in service at 13,200-volts on December 23, 1917. This station was first operated at 26,400 volts on April 14th when the distribution system from Stratford Transformer Station was changed from 13,200 volts to 26,400 volts.



### Moorefield

The local distribution system was completed and placed in operation the first of the year. The load taken is approximately 35 horse-power in addition to the lighting.

### New Toronto

The new step-down station having been completed, assistance was given the municipality in rearranging its distribution system so as to feed from this station. Assistance was also given in billing the larger power users.

### Niagara Falls

A number of investigations were made in connection with the power loads with a view to obtaining the maximum amount of power for munition plants in the following municipalities:

Niagara Falls, Wallaceburg, Welland, Sarnia, St. Catharines.

### Municipal Waterworks Pumping

A report was submitted to the Water Commissioners with preliminary estimates on various schemes for obtaining a satisfactory permanent water supply for the city, and the installation of pumping and filtering plants, but the cost of such complete systems at the present time is so high that temporary means were sought to prevent such shortage of water as has been experienced of late years under certain conditions of river flow and ice run. Construction now in progress consists of the laying of a 24-inch cast iron main with the necessary regulating valves from the new wood stave pipe of the Ontario Power Company to the intake well of the city pumping station. As a further provision against lack of water, specials have been inserted in this 24-inch main for attachment of a booster pump is necessary.

### Norwich

During the year assistance was given to the local Hydro-Electric System in the metering of waterworks power and the installation of an underground service.

Estimates were prepared for extensions in the townships outside of the village and assistance given in the operation of the same by the Norwich Hydro-Electric System.

### Distributing Station

Engineering work and plans were under way in December, 1917 to increase the transformer capacity of the Norwich station from 150-kv-a. to 450-kv-a. The reduction in load, due to the burning of the Woods Flour Mill in January, 1918, and the Company's decision to not rebuild the plant immediately, resulted in the cancelling of the proposed work on this station. The three 50-kv-a. Siemen's transformers originally installed have sufficient capacity to take care of the Norwich load.

### Oil Springs

The distribution system in Oil Springs was completed and put into operation during the year, power first being used on January 10th. Power is being used for the operation of the grist mill and a number of important oil wells in the municipality. The load on this system already exceeds the amount on which the original estimate was based.

### Palmerston

The switching equipment to control the 4,000-volt feeder to Drayton and Moorefield, which was referred to the last Report, was installed by the Canadian General Electric Company and placed in service on March 22, 1918.

### Paris

During the year engineering assistance was given to the municipality in connection with extensions to handle the extra power taken by the munition factory.

Other matters pertaining to operation of the system received attention at the request of the local management.

### Parkhill

During the year estimates were prepared showing the increased cost to deliver power to the municipality due to the high cost of labor and material, and on this account the Commission recommended against building a line to supply this municipality with power until the cost of labor and material has become more normal.

### Petersburg and St. Agathe

An extension to serve five farmers on the Sniders' Road was made from Petersburg east to the boundary between Wilmot and Waterloo townships.

### Preston

Assistance was given the local Water and Light Commission in connection with extensions to serve suburban customers. Several matters in regard to changes and extensions to serve the Milling Company with restricted power, billing customers, received attention by the Commission at the request of the municipality.

### Rodney

During the latter part of the year estimates on the cost of power for a local planing mill and flour and chopping mill were prepared and submitted to the municipality. Estimates on the cost of making the necessary extensions were also forwarded to the municipality.

It is expected that as soon as sufficient power is available the municipality will obtain these three new power contracts and make the extensions necessary to supply same.

### Sarnia

The three 185-kv-a. transformers for rotary converter supply, referred to in last Report were tested by the Commission's Engineer at the Canadian Westinghouse Company's factory on April 17, 1918, and have since been installed by the Sarnia Hydro-Electric System in its station.

### Scarborough Township

The work of constructing a distribution system in the southwesterly portion of the township was commenced early in the year, and with the exception of a street lighting system on the Kingston Road, the distribution system has been completed while the street lighting system is well under way.

### Seaforth

Engineering assistance has been given in connection with the purchase of additional apparatus to take care of large munition loads.

### Municipal Station

The installation of the 26,400-volt switching equipment in this station replacing the 13,200-volt equipment was completed on April 7, 1918 and the voltage of the feeder system from Stratford Transformer Station to Seaforth was changed from 13,200 volts to 26,400 volts on April 14th.

### St. Agathe—see Petersburg

### St. George

Extensions were made to handle the local chopping mill's 40 horse-power 550-volt motor during the year and assistance given in several other matters of operation.

The finances of the local system are in good condition and the operating report for the year satisfactory.

### St. Jacobs

Due to the village having an average load of 72 horse-power, the rate has been reduced to \$32.44 per horse-power per year. The original contract was on a basis of 35 horse-power at \$42.18 per year.

### St. Mary's

A gasoline engine, direct-connected to a centrifugal pump was purchased to replace the auxiliary steam pumps, and the old engines, boilers, steam pumps, etc., were disposed of.

The domestic water requirements are supplied by a new 4-inch, 2-stage Morris pump having a capacity of 280 Imperial gallons against 185 feet total head. This pump is driven by a 25 horse-power, 550-volt, 3-phase motor.

### Portland Cement

The installation work for the second bank of transformers in this station, referred to in last Report, was completed and placed in service on April 23, 1918.

### Stamford Township

The Stamford Township System was operated by the Commission for the Township of Stamford until October 1st, when it was taken over by the municipality and is now being operated under their supervision with the assistance of the engineers of the Commission.

### St. Thomas

Assistance was given the municipality in the arranging to supply the power and lighting loads from separate feeders so that a better control of the load on the system could be obtained during times of shortage of power caused by the munition loads.

### Municipal Station

At the request of the St. Thomas Hydro-Electric Commission, a 30-kw. Canadian General Electric Company Type "R.V.-60" constant-current transformer and switching equipment for an additional lighting feeder similar to those already installed, were purchased for them and are being installed by the Commission's Construction Department. It is expected that it will be completed and placed in service in November, 1918.

### Stratford

#### Municipal Station

The installation in the new station of the equipment referred to in last Report was completed by the Commission early in April, and on April 14th when the feeder system from Stratford Transformer Station was changed to 26,400 volts, this station being put into service at 26,400 volts.

#### Municipal Pumping Station and Connections

Two or three conferences have been held during the year with representatives of the Stratford Public Utility Commission regarding permanency of the water supply to existing pumping equipment. Arrangements are being made by the local commission for completion of installation, which they think to be satisfactory.

### Tavistock

This station, which had been operating as stated in last Report, at 13,200 volts was changed to 26,400 volts on April 14th when the voltage of all the feeders from Stratford Transformer Station was changed to 26,400 volts.

### Thamesford

Extensions were made to the local distribution system to handle the C.P.R. pumping load and the increased capacity of the Milling Company.

Assistance was also given the local management in connection with repairs to the system and better grounding of the 4-wire, three-phase, 4,000-volt system and in matters pertaining to the operation of the same.

### Thorndale

Extensions were made to the local system to handle the milling and chopping mill load. At the request of the municipality the Commission purchased the equipment and arranged to have the same installed.

During the year assistance was rendered in matters pertaining to the regularly billing of the power consumers and other matters of operation of the system.

### Tillsonburg

Assistance was given the local commission during the year in matters pertaining to metering the Milling Company's loads, the installation of booster equipment, and also on the operation of the Township of Dereham system, which the Tillsonburg Hydro-Electric Commission is handling.

As the load during the year increased considerably, the three 75.kv.a., 13,200/2,200-volt, single-phase transformers were sold and a bank of double the capacity was installed. Assistance was given the local commission in this matter.



### **Municipal Waterworks Pumping**

An independent fire service system is owned by the town, consisting of two rotary pumps geared to one turbine operated by water from a small lake. Shortage of water was experienced this year, the usual lake level not being maintained.

Under any conditions the power of the turbine was only sufficient to operate one pump at a time, and it was recommended that a 100-h.p. motor be installed and be belted to a pulley on one of the pumps, the motor being so located that a chain drive can be substituted for the belt drive at a future date. The installation of the motor and belt drive has been made, and these are now two complete units, one geared to the turbine and the other electrically-driven, the latter unit being operated whenever the reserve water in the lake may be considered insufficient.

### **Unionville**

Acting on request of the Police Trustees of Unionville an engineer visited this municipality and obtained information as to the probable power and lighting loads. Plans and estimates were made covering a distribution system which it was arranged should be fed from a line continued north from Agincourt.

By-laws providing for the raising of debentures to cover the cost of a distribution system and providing for the signing of a contract with the Commission for a supply of power were submitted to a vote of the people on September 16th, both by-laws being carried by large majorities.

### **Vaughan Township**

Early in the year a line was built from the village of Woodbridge to the hamlet of Maple in Vaughan Township, together with a distribution and street lighting system in Maple. In addition to supplying service to Maple, lighting and power service has been given to a number of rural customers as well as to the Women's Industrial Farm.

An agreement has been made between the Township of Vaughan and the Village of Woodbridge providing for the operation of the distribution system by the latter municipality.

### **Walkerville**

The Commission assisted the municipality in obtaining a new manager for its Hydro-Electric System after the resignation of the former manager.

Considerable assistance was given to the municipality in connection with the best method of operation with a view to obtaining the maximum amount of power for munition purposes.

### **Wallaceburg**

The changes in the building and equipment in the Wallaceburg Distributing Station, to obtain increased transformer capacity, as outlined in the last report, were completed by the Commission's Construction Department and the station was placed in service on September 2, 1918.

The 4,000-volt, 450-kv-a. feeder equipment, installed for the municipality, was placed in service on the same date.

### **Welland**

The installation of the switching equipment referred to in last Report was sufficiently advanced so that on March 31st, the new station was put into service with the two 1,500-kv-a. transformers.

In January an order was placed by the Commission with the Canadian Westinghouse Company for the 45,700-volt switching equipment for one outgoing line to Dunnville and for a second incoming line: this equipment to be installed in the Welland Municipal Station. The installation was carried out by the Commission's Construction Department and the new incoming line was placed in service on May 14th, and the outgoing line to Dunnville on May 18th.

### Woodbridge

The installation of the 4,000-volt feeder to supply power to Vaughan Township, as given in the last Report, was completed by the Commission's Construction Department on March 21, 1918, and was placed in service on May 11, 1918.

### Windsor

The supply for this city flows from the Detroit River to a series of small intake wells, from which the water is drawn through long suction pipes to various steam pumping units of reciprocating type. Two of these units are of modern design, while three more are of obsolete type. A report was made involving the installation in place of these three units of two motor-driven centrifugal pumps for domestic service with a new intake well and provision for boosters in the discharge mains to give the pressure required for fire service.

A contract has been made with the Goldie & McCulloch Company of Galt for the supply of the two domestic units, each consisting of a 4,200-gallon pump direct connected to a 300 h.p., C.G.E. induction motor with the necessary switchboard. The capacity of the pumps can at any time be increased by 20 per cent. without change in pressure or efficiency, by slight machining of the impellers, and the motors will furnish the additional power without objectionable overload. The layout also provides for a 26-inch Venturi meter, and space in the pump room for a series of low lift units, it being anticipated that a filtration system will shortly be added to the plant, in which case, the low lift pumps will draw from the new suction well, and the units now under way will take water under a slight head from the clear water basin under the filters.

### Street Railway

The present street railway tracks are so arranged that cars sometimes operate on the wrong side of Ouellette Avenue and it is necessary for passengers on London Street West to travel by a very circuitous route to reach their destination. The city is endeavoring to correct these faults by appearing with the street railway company before the Ontario Railway Board.

The decision of the Board last winter required the city to allow the street railway company to construct tracks on some new streets and the city has requested our advice in this connection. They also asked for estimates on the cost of constructing another railway and of acquiring the present street railway. Our engineers made a valuation of the existing property and the matter is now before the Commission for consideration.

## SEVERN SYSTEM

### POWER CONSTRUCTION

#### Big Chute Generating Station

Due to the severe winter conditions in this district, the work on the superstructure referred to in last Report was held up early in December and later the contract with Messrs. Wells and Gray was cancelled and arrangements were made for the Commission's Construction Department to carry on the work in the spring. Work was resumed in May and the building was completed in October.

In order to provide better ventilation during the hot weather, two fans have been purchased, one being supplied by Sheldons, Limited, and one by the Canadian Blower and Forge Company. These fans will be installed one at each end of the generator room by the Commission's Construction Department and will be ready for service before the summer of 1919.

It has been decided to lay new roofing on the old section of the building, which work will be carried out in 1919 by the Commission's Construction Department.

To provide better accommodation for the operators, a new cottage will be erected during the coming year.

The new 1,600-kv-a. generator has been delivered by the Canadian General Electric Company who are proceeding with the installation and it is expected that the new unit will be ready for service during January, 1919.

The contract for the switching apparatus was placed with the Canadian Westinghouse Company in November, 1917, but the installation of same as well as all changes in the switching equipment will be done by the Commission's Construction Department. These changes will be completed early in 1919.

The new steel penstock has been completed, including concrete anchors and supports for the same.

The head gate on the new pipe line with its operating mechanism has been erected ready for operation, but it will be necessary to wait until the new unit is ready to carry the load before the old pipe can be unwatered and the head gate for the same installed.

In the meantime the superstructure for the gate house cannot be completed until this second head gate has been erected.

During July one of the valves on the old turbines which it had been impossible to operate was replaced by a new butterfly valve. The power house substructure and superstructure has been practically completed by the Construction Department. The 2,300 brake horse-power turbine and governor has been erected by the Wellman-Seaver-Morgan Company, and is ready for operation as soon as the final connection with the generator and minor adjustment to the governor have been made. It is expected that this will be done in January, 1919.

### Spare Transformer

In July, the purchase of a 50-kv-a. three-phase, 22,000/2,300/4,000/575-volt, 60-cycle, Canadian General Electric Company outdoor type transformer was authorized to be used as a spare for the Severn System. This transformer was received in July and is stored in the sub-station at Barrie, which is considered the most suitable location for it.

## MUNICIPAL WORK

### Alliston

#### Distributing Station

The installation of the transformer and switching equipment in this station, as outlined in the last Report, was completed and the station was placed in service on May 23, 1918.

#### Municipal Waterworks Pumping

On account of the heavy expenditure involved, due to war prices, the equipment covered by last year's report, page 150, was not entertained. A belt-driven pump was purchased by the town officials to handle its domestic requirements.

### Barrie

On account of the location of the two sets of incoming line disconnecting switches, entrance vestibule and phone booth in this station, the operation of the disconnecting switches was very difficult. Alterations in this equipment were decided upon in June, 1918, and all material necessary for an additional bus structure was transferred from the Midland Distributing Station. The disconnecting switches which were originally mounted on the wall above the line entrance bushings were moved to a location immediately below these bushings. The station entrance and vestibule were moved. The bus was extended and its spacing increased throughout. The lightning arrester was moved to the new end of the extended bus. The alterations to the building were made by the Municipality of Barrie and the changes in the electrical equipment by the Commission. These changes were completed by September 8, 1918.

### Beeton

The construction of a standard outdoor pole type distributing station was decided upon in December, 1917, to supply power to Beeton. The equipment consists of a Hydro-Electric Power Commission's standard 22,000-volt, air break switch, Delta Star fuses, choke coils and arrester, one 75-kv.a., 3-phase, 22,000/-2,300/4,000/575-volt, 60-cycle, Moloney Electric Company outdoor type transformer, and one 4,000-volt feeder protected by expulsion fuses. The metering equipment consists of a Canadian Westinghouse Company type "RA" polyphase graphic integrating demand wattmeter with suitable instrument transformers housed in a corrugated metal meter-house.

This station was erected and the equipment installed by the Commission's Construction Department and was placed in service on July 26, 1918.



### Bradford

#### Distributing Station

The construction of a modified type "H" station was decided upon in December, 1917, to supply the municipality of Bradford. Plans and specifications were prepared and the building was erected by the Commission and completed in June, 1918.

The station is fed by one 22,000-volt line through a Hydro-Electric Power Commission standard air break switch and Canadian Westinghouse choke coils and fuses, and is equipped with Delta Star outdoor type lightning arresters. The transformer equipment consists of one bank of three 100-kv-a., single-phase, 60-cycle, 22,000/2,300/575-volt Moloney Electric Company transformers operating at 575-volt secondary and one bank of three 15-kv-a., single-phase, 60-cycle, 2,300/575-volt Canadian General Electric Company service transformers. The switching equipment, purchased from the Canadian Westinghouse Company, consists of one outgoing 575-volt 300-kv-a., three-phase feeder from which is tapped, through expulsion fuses, a circuit to the 15-kv.a. transformers to supply one outgoing 2,300-volt three-phase feeder. The 575-volt and 2,300-volt feeders are equipped with Garton-Daniels arresters. The metering equipment consists of Weston ammeters and a voltmeter and a Canadian Westinghouse type "R.A." polyphase graphic integrating demand wattmeter.

All the installation work in this station was done by the Commission, and the station was placed in service on September 16, 1918.

#### Street Lighting

A 7½-kv-a., 2,300-volt, 60-cycle 6.6 ampere Canadian General Electric Company's type "R.O." constant current transformer equipped with an Anderson type "L" time switch, was installed in the station, for the municipality, to supply the street lighting. This circuit was tapped off the 2,300-volt bus erected above the 15-kv-a. service transformers and was placed in service with the rest of the equipment on September 16, 1918.

### Collingwood

#### Distributing Station No. 1

The extension to the Collingwood Station building and the additions to the equipment in same, as outlined in the last Report, were completed. The Waterworks and Kennedy feeder panels installed for the municipality were placed in service on December 22, 1917, and the new 22,000-volt lines on January 20, 1918.

Further changes in the station equipment were decided upon during the current year partly to improve the automatic protection of the equipment but chiefly to supply the increased power demand of the Wm. Kennedy and Son's steel mill. The relays and trip coils on all the 22,000-volt Canadian General Electric type "K-24" oil breakers and the 2,300-volt Canadian General Electric type "K-5" oil breakers on the transformer feeder panel, are being changed, where necessary, for direct current shunt trip operation. A Canadian Hart Accumulator type "C.A.L." No. 9, 12-volt, 50-ampere hour battery is being installed for operating the direct current tripping circuit. Meter connections are being changed to measure the total station load on the 22,000-volt incoming lines.

A 24-inch exhaust fan was purchased from Sheldon's, Limited, to be installed in this station to obtain greater ventilation.

A new 22,000-volt feeder is being installed in the station to feed Collingwood Station No. 2 at the William Kennedy and Sons steel mill. This feeder is connected to the 22,000-volt double busses through Canadian General Electric selector disconnecting switches and type "K-24" oil breakers and Hydro-Electric Power Commission's choke coils.

These changes are being made by the Commission's Construction Department and will be completed early in 1919.

#### Distributing Station No. 2

Owing to the increased power demand of the William Kennedy & Sons Steel Mill, the purchase of a second bank of three 400-kv-a. single-phase, transformers was decided upon, in June, for the Collingwood Distributing Station but arrangements were made with this Company whereby this new bank of transformers with the necessary switching equipment is to be installed in a building provided by the Company at their plant.

The building is a one-storey brick structure, 34 feet by 21 feet by 18 feet high, similar in design to the standard type "G" sub-station. Space is provided for one incoming 22,000-volt line, one bank of three 400-kv-a. transformers, one bank of three 200-kv-a. transformers, one 2,300-volt and four 550-volt outgoing feeders. Plans and specifications for the new station were prepared by the Commission and the building was erected by William Kennedy and Sons.

The station will be fed by one 22,000-volt incoming line from Collingwood Station No. 1 through a Hydro-Electric Power Commission's standard air break switch and choke coils and Delta Star type "S and C" fuses and will be equipped with Delta Star outdoor type lightning arresters. This equipment was purchased by the Wm. Kennedy Company.

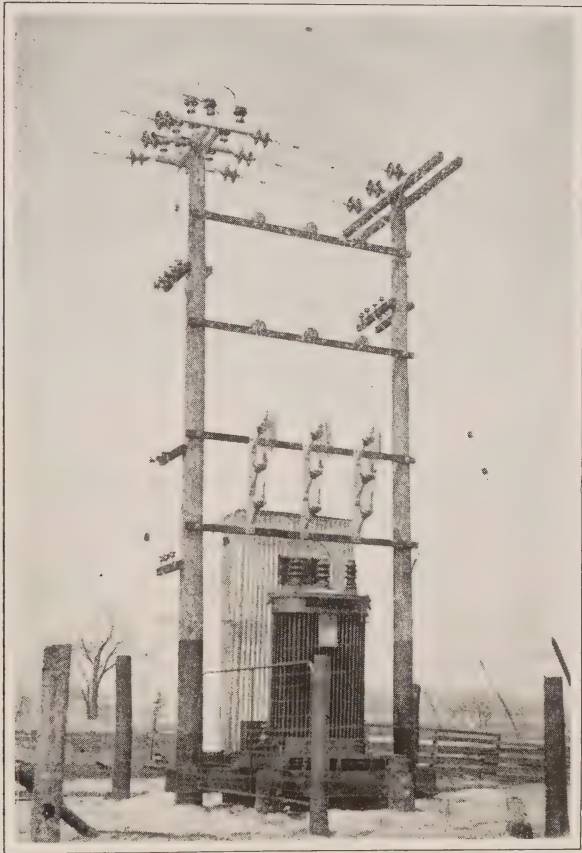
The station equipment will consist of one bank of three 400-kv-a., single-phase, 60-cycle, oil insulated, self cooled, 22,000/2,300/575-volt Canadian General Electric transformers, one low tension transformer panel, meters and switching equipment were purchased from the Canadian General Electric Company. One 2,300-volt feeder panel including meters and switching equipment all of which is to be transferred from station No. 1 to this station is to supply power to the William Kennedy Company.

The installation work is being done by the Commission's Construction Department and it is expected that the station will be completed and placed in service the latter part of December, 1918.

#### Cookstown

The construction of a standard outdoor pole type distributing station was decided upon in December, 1917, to supply power to Cookstown. The equipment consists of a Hydro-Electric Power Commission's standard 22,000-volt, air break switch, Delta Star fuses and choke coils, one 75-kv.a., 3-phase, 22,000/2,300/4,000/-575-volt, 60-cycle, Canadian General Electric outdoor type transformer, and one 4,000-volt feeder protected by expulsion fuses. The metering equipment consists of a Canadian Westinghouse Company type "RA" polyphase graphic integrating demand wattmeter with suitable instrument transformers housed in a corrugated metal meter house.

The station was erected and the equipment was installed by the Commission's Construction Department, and was placed in service on April 25, 1918.



Cookstown Distributing Station, outdoor type.



## Midland

### Synchronous Condenser

To improve the power factor of Midland Station, it was considered advisable to install a synchronous condenser and the Midland Water and Light Commission purchased from the Kingston Civic Utilities Commission a 300-kv-a., 2,300-volt Canadian General Electric synchronous generator complete with exciter and switch-board panel, oil switch, and meters. The generator was shipped to the Canadian General Electric Company's factory where it was converted into a self starting synchronous motor and then shipped to Midland together with a new starting compensator.

As there was no space available in the sub-station for the condenser, it was decided to place it in the boiler room of the Municipal Pumping Station. A space 24 feet by 11 feet 7½ inches in the corner of this room was sectioned off with metal lath and plaster partitions in which a large door was provided. Plans and specifications for this room and the condenser foundations were prepared and submitted to the local Commission who did the work.

The condenser with its panel and switching equipment, was installed in the room mentioned above and was connected by lead covered cable in conduit, to the leads which were brought across from the waterworks feeder panel in the sub-station to supply power to the waterworks pump motors. All the installation work was done by the Commission's Construction Department and the condenser was placed in service on September 11, 1918.

### Distributing Station

The changes in the equipment in Midland Station, as outlined in the last Report, were completed in October, 1918.

Due to the increased load required by the Midland Shipbuilding Company, it was decided to transmit power at 22,000 volts to a small sub-station located at their plant and it was necessary to enlarge the Midland sub-station for this additional feeder.

At the request of the Midland Water and Light Commission, plans and specifications were prepared for an extension to the end of the present sub-station. The new extension is 23 feet wide by 24 feet long by 17 feet high, inside dimensions, and was made similar in all respects to the present building. It was made large enough to accommodate a second bank of three 300-kv-a., 22,000/2,300-volt transformers and two 22,000-volt feeders with switching and protective equipment. The building drawings were made and forwarded to the Midland Commission which had the building erected and completed in June.

The present 22,000-volt busses were extended through single pole, double throw double blade disconnecting switches, into the new extension and one 22,000-volt outgoing feeder was connected to the busses through Canadian Westinghouse disconnecting switches and choke coils, and a Canadian General Electric Company type "K-24" oil switch, to feed the station at the Midland Shipbuilding Company's plant. Canadian General Electric electrolytic lightning arresters were also connected through disconnecting switches to this feeder.

It was decided to meter the power on the 22,000-volt incoming lines instead of on the 2,300-volt busses and to do this, the 40/5 ampere, 22,000-volt current transformers on the two incoming lines were replaced by Canadian Westinghouse 60/5/5-ampere, 22,000-volt, type "KC" current transformers to which the station recording wattmeters were connected as well as the relays.



The ammeter scales, current transformers and cables on the Waterworks feeder were changed to larger capacity as the new 300-kv-a. synchronous condenser is fed off this feeder as well as the pump motors.

This installation was done by the Commission's Construction Department and was placed in service August 1, 1918.

#### **Manley Street Municipal Station**

Engineering assistance was given to the Water and Light Commission of Midland in connection with the design, purchase of apparatus and material for and the construction of a sub-station located at the Midland Shipbuilding Company's plant.

At the request of the Water and Light Commission of Midland, plans and specifications for an outdoor pole type sub-station were prepared. The station is fed from the Midland sub-station by one 22,000-volt line through a Hydro-Electric Power Commission's standard air break switch and outdoor type choke coils and fuses. The transformer equipment consists of three 300-kv-a., single-phase, 60-cycle, 22,000/2,300/575-volt Canadian General Electric outdoor type transformers. A small sheet metal meter house was erected by the Midland Water and Light Commission in which were placed two switchboard panels with meters controlling two 2,300-volt outgoing feeder switching equipments. One feeder is to supply the Midland Shipbuilding Company and one is to be used as a tie-line to the Midland Distributing System. These switching equipments consist of Canadian General Electric 4,500-volt, type "K5," 300-ampere oil switches, Canadian Westinghouse type "KA" current transformers, Condit type "A" inverse definite time overload relays, and are each equipped with Garton-Daniels lightning arresters. The metering equipment consists of Westinghouse type "TM" ammeters, a Weston voltmeter, and an Niagara Electric Improvement Corporation's recording wattmeter. All the construction work, with the exception of the erection of the sheet metal meter-house, was done by the Commission's Construction Department. The station was placed in service on May 12, 1918.

#### **Port McNicoll**

##### **C.P.R. Distributing Station**

The three 500-kv-a. transformers which were shipped from the Canadian General Electric Company's factory in October, 1917, were installed temporarily without the water supply being connected and were first placed in service with one high tension line feeding the station on November 16, 1917. The second high tension line was connected temporarily on November 26th. and the permanent equipment including water connections to the transformers was installed in February, 1918.

#### **Thornton**

The construction of a standard outdoor pole type distributing station was decided upon in December, 1917, to supply power to Thornton. The equipment consists of a Hydro-Electric Power Commission's standard 22,000-volt air break switch, Delta Star fuses and choke coils, one 25-kv-a., 3-phase, 60-cycle, 22,000/-2,300/4,000/575-volt Moloney Electric Company outdoor type transformer and one 4,000-volt feeder protected by expulsion fuses. The metering equipment consists of a Canadian Westinghouse Company type "RA" polyphase graphic integrating demand wattmeter with suitable instrument transformers housed in a corrugated metal meter-house.

The station was erected and the equipment was installed by the Commission's Construction Department, and was placed in service October 16, 1918.

### Tottenham

#### Distributing Station

The construction of a standard outdoor pole type distributing station was decided upon in December, 1917, to supply power to Tottenham. The equipment consists of a Hydro-Electric Power Commission standard 22,000-volt air break switch, Delta Star fuses, choke coils and arrester, one 75-kv.a., 3-phase, 22,000/-2,300/4,000/575-volt, 60-cycle Moloney Electric Company's outdoor type transformer and one 4,000-volt feeder protected by expulsion fuses. The metering equipment consists of a Canadian Westinghouse Company type "RA" polyphase graphic integrating demand wattmeter with suitable instrument transformers housed in a corrugated metal meter-house.

This station was erected and the equipment installed by the Commission's Construction Department, and was placed in service on September 9, 1918.

#### Municipal Waterworks Pumping

The municipality requested an investigation of its waterworks system with a report as to the best method of improving the local pumping plant. The Commission's recommendations are being prepared.

## EUGENIA SYSTEM

### POWER CONSTRUCTION

The extension to the Eugenia Falls plant was carried on by the Construction Department during the past year. The power house superstructure has been completed. The substructure has been carried as far as it is possible until the new turbine and crossover from the present penstock have been erected. The turbine of 4,000 brake horse-power capacity has been on the ground for several months, but the abnormal conditions existing during the year have delayed the delivery of the crossover and distributor pipe, which are of heavy steel plate construction. Owing to the lessening of the stringent measures in regard to steel plate work, delivery of the crossover and distributor is expected at an early date, and the unit will be in operation early in 1919.

This work was commenced in November, 1917, and has been in progress during 1918.

#### Generating Station

The 1917 extension to the station building which was described in last year's Report was completed to such an extent in the early spring of 1918 as to allow the installation of the new electrical equipment.

The new transformer bank and switching equipment supplied under contract with the Canadian Westinghouse Company as noted in last year's Report, has been erected by the contractor in the new extension to the building and was ready for service in September, 1918.

The generator also supplied under contract with the same Company has been delivered at Flesherton but owing to bad roads its transportation to the power house is being held up until snow roads can be used.

The complete equipment comprises a second bank of three 900-kv-a. power transformers, one 2,820-kv-a. generator, switchboard and metering equipment, high and low tension double bus structure and three outgoing 22,000-volt lines. Space is also available in the extension for future installations as mentioned in last year's Report.

The original switching equipment in the old station is now being changed to the double bus system to be identical with the newly installed equipment. This change-over will be carried out by the Commission without interruption or reduction in capacity to the Eugenia System. The original high and low tension switching equipment will be taken out of service by transferring the switching of both No. 1 and No. 2 units to the newly installed equipment for No. 3 generator, thus allowing the removal of all the original equipment in order that the old north and east walls of the original building can be removed and the new station building completed. The switchboard metering and control equipment of the original units will be transferred into the new extension during January and February, 1919.

Ten 10-kw., 3-phase, 550-volt air heaters, built by the Commission, will be used in connection with the station service transformers for heating in the extension.

A septic tank has been completed on the north side of the tail race to take care of the station and old cottages and also one on the south side for the new cottages.

The station should be operating with increased capacity by April, 1919.

### Eugenia Cottages

Two operators' cottages, "Cleveland" model, were purchased from the Canadian Aladdin Company, in May, 1918, and erected by the Commission on concrete foundations to the south of the Generating Station. Both cottages are equipped with plumbing, electric lighting and heating, and the adjoining ground is graded and fenced. One 20-kw. 2,200/220/110-volt service transformer is connected for service to each cottage, and supplies a range, water heater, lighting, and five 3-kw., 220-volt National Electric Heating Company portable air heaters. The body of the cottages outside are painted light buff, and the top section and the roof moss green shingle stain. Cottages should be ready for occupation about January 15, 1919.

A frame barn has also been built to house the operators' horses.

### MUNICIPAL WORK

Engineering advice and assistance in connection with the operation and management of the local systems in general was given to the following municipalities, and engineers of the department made periodical trips to each town and village for such purposes: Owen Sound, Markdale, Chatsworth, Flesherton, Dundalk, Shelburne, Orangeville, Grand Valley, Arthur, Mount Forest, Holstein, Durham, Hanover, Neustadt, Elmwood, Chesley, Tara.

The lines of the Hanover Electric Light Company outside of the municipality of Hanover were purchased, reconstructed and connected to the Eugenia System for the purpose of supplying power to the Village of Neustadt and the hamlet of Carlsruhe.

Assistance and engineering advice was given to the officials of Derby and Artemesia Townships in connection with supplying power to rural customers.



Estimates and rates were prepared and submitted, and investigations made in connection with supplying power to hamlets in Normanby and Proton Townships, and portions of Mono, Caledon and Melancthon Townships.

Valuations were made and submitted of existing distribution systems, and engineering advice given concerning the operation of same in the municipalities of Teeswater and Lucknow.

Estimates and rates were prepared and submitted, and assistance given in connection with placing money and enabling by-laws before the ratepayers of the Village of Kimberley.

Estimates and rates were prepared and submitted, and investigations made concerning the delivery of power to the Villages of Hillsburgh and Ayton.

An investigation was made and estimates prepared and submitted in connection with a power development on the Big Head River for the Town of Meaford.

Engineering advice was given, plans prepared and construction work supervised in connection with extensions to the distribution systems in the following towns for the purpose of supplying power to additional customers: Arthur, Durham, Elmwood, Tara, Hanover, Chesley, Orangeville, Grand Valley.

Power was delivered for the first time to the Municipality of Tara on January 3rd.

### Derby Township

#### Kilsyth Distributing Station

The construction of a standard pole type sub-station at Kilsyth, as outlined in the last Report, was completed and placed in service on January 1, 1918. It was decided to replace the Canadian Westinghouse type "R.O." polyphase demand wattmeter with their new type "R.A." polyphase graphic integrating demand wattmeter and the new meter was ordered in March, 1918.

### Durham

The substation of the National Portland Cement Company, construction of which was begun in the year 1917, was completed during the year and placed in operation for the first time during the month of May, and 25-cycle power delivered to the company by means of a frequency changer set.

#### Frequency Changer Set

Electrical equipment as noted in last Annual Report was purchased and installed by the Commission in the location allotted in the boiler room of the Durham Portland Cement Company.

The frequency changer set, manufactured by the Electric Machinery Company, of Minneapolis, and purchased by the Commission, was put into operation in April, 1918.

### Elmwood

The construction of a standard pole type station at Elmwood, as outlined in the last Report, was completed on March 1, 1918, and was placed in temporary service with a spare 75-kv-a., three-phase transformer. The 50-kv-a. transformer was placed in service on May 23rd in place of the 75-kv-a. transformer. It has been decided to replace the Canadian Westinghouse Type "RO" polyphase demand wattmeter with their new type "RA" polyphase graphic integrating demand wattmeter and an order for this meter was placed in March, 1918.



### Grand Valley

Owing to the severe electrical storms experienced in this district, it was decided to install a lightning arrester on the 22,000-volt incoming line to Grand Valley Station. A 22,000-volt, three-phase, Delta Star outdoor type lightning arrester was purchased in June and was installed outside on the station wall by the Commission's Construction Department. The installation was completed and the arrester was placed in service on October 18, 1918.

### Hanover

The distribution system in this municipality was reconstructed and placed in operation during the year. A contract between the Commission and a large flour mill in the municipality, which was executed prior to the entry of the town into the Hydro System, was turned over to the local officials.

Connections were made to the Cement Mill and several furniture factories, and before the local system had been in operation a year the demand for power had considerably exceeded the original contracted amount, making it necessary to increase the transformer capacity in the substation.

#### Distributing Station

The installation of the electrical equipment in the new type "G" station at Hanover, as given in the last Report, was partially completed and the station put in temporary service at 2,300 volts on December 9, 1917. The installation was entirely completed ready to change over to 4,000 volts on June 21, 1918, but the Hanover Portland Cement Company and other power consumers were not ready for the change to 4,000-volt service at that time. Arrangements have been made to make the change in voltage and put the station in permanent service early in November.

#### Hanover Portland Cement Co. Municipal Station

The Canadian Westinghouse type "RO" integrating maximum demand watt-meter on the Hornings' Mills feeder in the Shelburne distributing station, was sold to the Hanover Hydro-Electric System and, at their request, was installed by the Commission with the necessary instrument transformers, at the Hanover Portland Cement Company's plant. The installation was completed and the equipment was placed in service on October 7, 1918.

### Neustadt

Money and enabling by-laws were passed in this municipality and a contract executed with the Commission for supply of Hydro power. Assistance was rendered by engineers of the Department in placing these by-laws before the ratepayers. On the authority of the local officials plans were prepared for re-building the distribution system, construction of which will be undertaken early next year.

## WASDELL'S SYSTEM

### General

Assistance was given to the following municipalities in the nature of engineering advice, explanation to customers concerning application of rates, and in general on matters relating to the operation and management of their various distribution systems, and periodical trips were made by engineers of the department to each municipality for such purposes: Brechin, Beaverton, Woodville, Sunderland, Cannington.

Plans and estimates were prepared, and an investigation made in connection with extending the lines of the Wasdell's System to serve Uxbridge and Port Perry, and assistance was given both municipalities by engineers of the department concerning the use and application of Hydro power.

Estimates and reports were prepared and submitted covering rates, and the cost of service to portions of the Townships of Brock and Thorah.

### MUNICIPAL WORK

#### Brock Township

A rural line was constructed in Brock Township east from Sunderland, giving service to four farms, and preparations made for constructing a similar line west from Sunderland in the same township, for the purpose of serving six additional farms. It is expected that the new line will be placed in operation early next year.

#### Brechin

Plans and estimates were prepared for an extension of the distribution system for the purpose of supplying the increased demand of an additional customer.

#### Beaverton

A study was made of local conditions in Beaverton, with the idea of developing the power load in this municipality, the results of which appear very promising as the average load for 1918 has increased considerably over that of 1917. (See under Operation of Systems.)

#### Thorah Township

A new line was constructed and placed in operation in Thorah Township for the purpose of serving summer cottages at Cedarhurst and Maple Beach in the vicinity of Beaverton. Plans are being considered for extending this line to serve twenty farms located within the boundaries of the same township.

## CENTRAL ONTARIO SYSTEM

### POWER CONSTRUCTION

#### Auburn

##### Generating Station (Peterborough)

Drawings have been prepared showing necessary alterations to the cornice on the roof of the Auburn Generating Station. A few rounds of broken tile will have to be removed and new tile placed. The gutter will also have to be renewed. The construction work is being done by the Operating Department.

### Fenelon Falls

#### Generating Station

In the last Annual Report it was stated that various changes were to be made at the Fenelon Falls Generating Station so that 44,000-volt power would be delivered direct to the transmission lines of the Central Ontario System but due to the high cost of the work involved, it has been decided to postpone this work for the present.

To take care of present conditions it was decided to purchase a 750-kv-a., 44,000/25,400-volt primary 2,400/1,200/600-volt secondary, 60-cycle, 3-phase transformer from the Canadian General Electric Company with a minimum amount of switching equipment. It is expected that it will be ready for service in December, 1918.

### Healey Falls

Construction work on this site was begun in November, 1917, and has been in progress during the year. During August the foundations for the turbine were installed.

The programme for the extension of this plant has been followed out during the past year. The new penstock has been delivered and erected by the Dominion Bridge Company, and the Wellman-Seaver-Morgan Company has completed the erection of the 5,600 brake horse-power turbine. This new equipment is ready for test as soon as the generator is connected.

Excavation in the tail race necessary to accommodate the additional flow from the new unit is rapidly nearing completion and less than 15 per cent. of the rock remains to be taken out. It is expected that this work will be completed early in 1919.

#### Generating Station

The additional switching and metering equipment required for the operation of No. 4 generator which is being supplied by the Canadian Westinghouse Company on Contract, is now practically all installed.

The 3,750-kv.a. generator ordered from the Swedish General Electric Company and to be known as No. 4 generator has been manufactured but has not yet been shipped from Sweden, due to the war shipping difficulties which have been wholly to blame for the delay. It is now expected that shipment will be made early in 1919.

Drawings have been made for the ventilation of the Generating Station showing installation of fans in ends of building. The equipment for this installation has been ordered and delivered.

### Ranney Falls Development

Some preliminary work has been done and it is expected to commence the designs shortly for a development at Ranney Falls on the Trent River just below the Town of Campbellford.

The electrical equipment will probably consist of three 3-phase, 60-cycle, 6,600-volt generators, six 60-cycle, single-phase, 44,000/6,600-volt transformers with all necessary switching equipment including double high and low tension busses. Provision will be made to receive power at 6,600 volts from two proposed developments one at dam No. 8 which is three miles downstream and the other at dam No. 9 which is one and one half miles downstream.

## MUNICIPAL WORK

### General

Material has been ordered for the electrical heating of Belleville, Lindsay, Cobourg and Bomanville Distributing Stations. The installation work is being done by the Operating Department.

### Belleville

#### Service Building

Plans and specifications have been prepared for alterations to the Belleville Garage, a building 40 feet by 70 feet, to make it a two storey structure with a basement under a portion of it. The alterations include partitions for machine shop, repair rooms and offices, installation of heating, lighting and a general overhauling of building.

This construction work is being done by the Operating Department.

Power has been supplied throughout the year to the Tivani Electric Steel Company for use in electric furnaces for the production of ferro-molybdenum and low-phosphorus pig iron.

#### Municipal Waterworks Pumping

Of the electrically-driven pumping plant described in last year's report, two units have been put in operation, all of the original steam pumps have been removed and two units which will make the station complete are now being installed.

It is intended to fit up one of the steam pumps in the adjoining boiler room, as a reserve, pending the completion of the duplicate transmission line to the pumping station.

### Bloomfield

Power will be delivered early in 1919 to this municipality over a 4,000-volt line of No. 2 steel reinforced aluminum carried on the high tension poles, from the sub-station at Wellington.

Arrangements have been made for the construction of a modern distribution and street lighting system. This work will be handled under the direction of the Commission, local labor being used as largely as possible.

### Brooklin

In connection with East and West Whitby Township rural extensions out of Oshawa, the Village of Brooklin was supplied with power at 4,000 volts.

A three-phase distribution system supplies fifty domestic and commercial consumers and four power consumers.

The line was also extended as far as Greenwood, where a load of 35 horse power was secured.

#### Street Lighting

A new street lighting system was installed for this municipality by the Commission. Thirty-five series lighting units, 80 watts each, are fed from a 5-kw. pole-type constant-current transformer with a 6.6 ampere secondary circuit. This circuit was placed in operation on March 18, 1918.



### Cobourg

#### Gas Plant

An investigation was made with preliminary drawings and estimates on the prospects of utilizing the gas benches at Cobourg for the production of limed coke, which was to be subsequently charged into electric furnaces for conversion into calcium carbide.

The scheme involved the crushing and mixing of quicklime and gas coal, the mixture being charged to the retorts, part of the resulting gas to be burned under the retorts and the balance to be delivered to the town mains. The charge would be drawn directly into a special buggy and removed to the furnace room. An objectionable feature of the scheme was the necessity of excluding the atmosphere from the limed coke until cool and ready for charging to the electric furnaces. It was decided that the cost of installation was not warranted in view of the experimental nature of the scheme.

An installation is now being made of a motor-driven pump and the necessary piping for the purpose of creating a rapid circulation of the surface water in the gas-holder tank.

A large quantity of steam has hitherto been necessary to prevent ice formation, and it is expected that the motion of the water and the resulting oil foam on the exposed surface will make the use of steam in cold weather unnecessary.

#### Pumping Station

Some trouble was experienced last winter due to fish and material being drawn through the new intake. A diver was sent down in the summer and discovered that rock filling about the pipe at its entrance to the intake box had been carelessly placed by the contractors, and this was made good with concrete.

The gasoline-driven fire pump described in last year's report has been in operation condition for nearly a year and gives good satisfaction. Trouble was experienced on starting the new engine and the makers sent an erector from the works who found several broken piston rings and a faulty bearing, due apparently to unsuitable material or shop testing. No trouble has developed since these defects were made good.

In order to avoid sending the starting battery to a garage to be recharged, which would entail the purchase of a spare battery, the generator has been removed from the engine and is now being fitted with base and pulley, so that it can be driven at any time from one of the electrical units in the adjoining room. The battery can thus be always kept in first class condition without expense.

### Consecon

An investigation was made and necessary data compiled regarding load available was secured to enable the Commission to include the village and surrounding district in the future development of the district.

### Hallowell Township

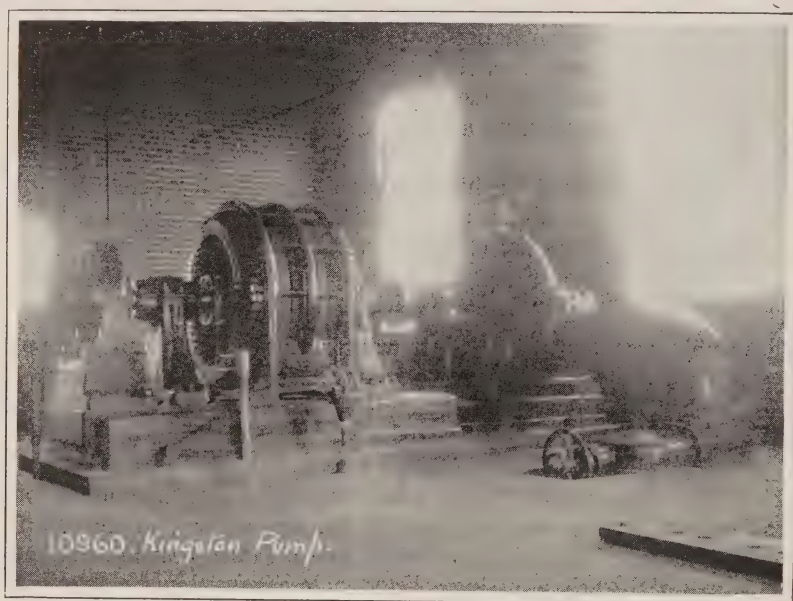
Arrangements are being made for a supply of rural power to the farmers in this district to be taken from the Bloomfield feeder, and extensions of same.

### Kingston

A 44,000-volt high tension line between Napanee and Kingston was completed and power was turned on December 13, 1917. Power is being supplied Kingston

from the Central Ontario System, the generating stations being located on the Trent River Canal. A portion of the municipal generating station was remodelled for a substation in which three 750-k.v.a., 3-phase, 60-cycle, 44,000/2,400-volt transformers were installed, together with suitable switching and protective equipment.

A 225 horse-power synchronous 2,200-volt a.c.—600-volt d.c. motor generator set was installed to provide power for railway purposes. This was a second-hand unit purchased from Sarnia. A 450 horse-power, 2,200-volt synchronous motor was also purchased from Sarnia. This was a two bearing machine, but was converted into a three bearing machine which was belted to a 250-k.w., d.c., 600-volt generator purchased second-hand from the General Electric Company. These units have handled the railway load very satisfactorily.



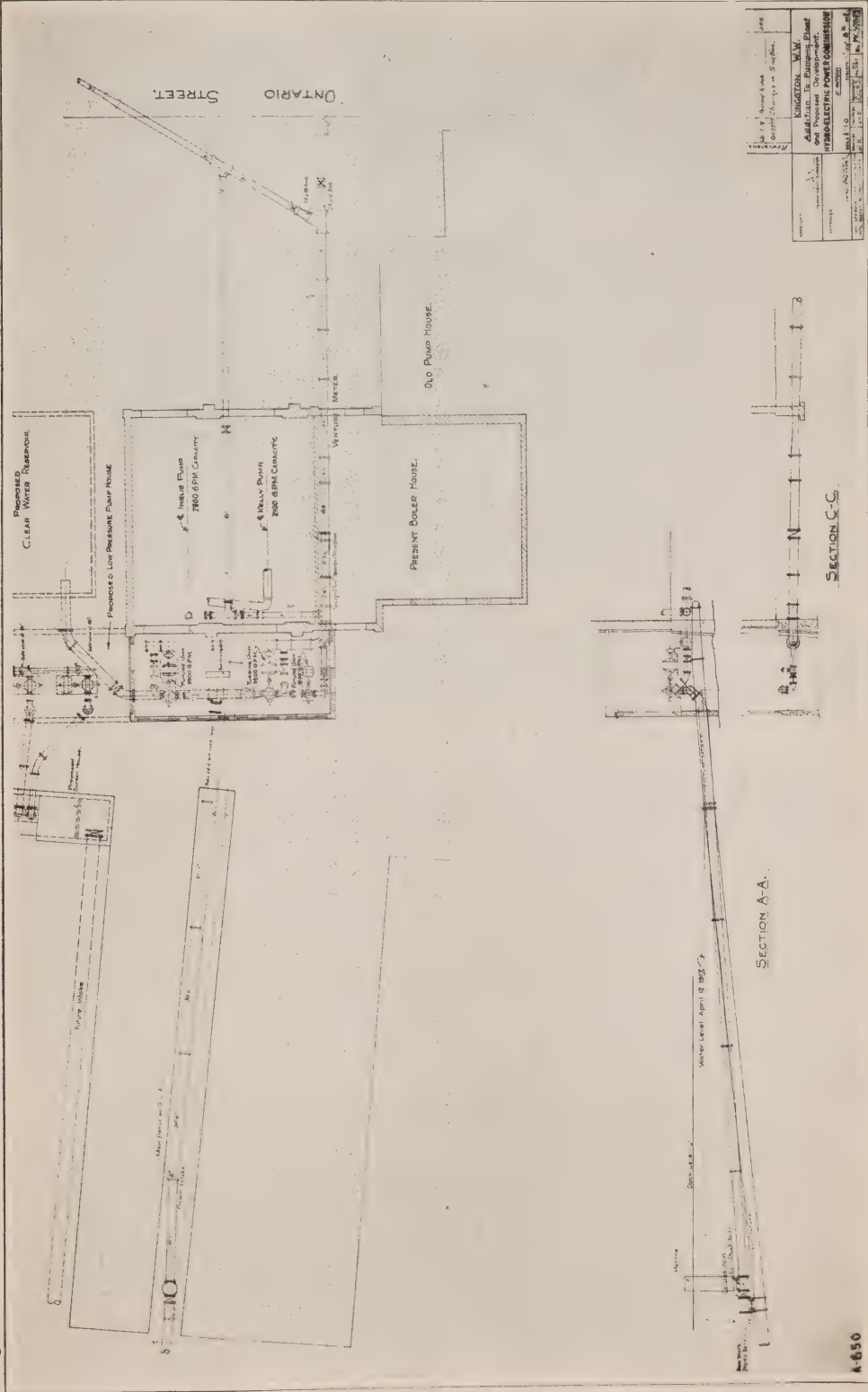
A 3,500 gallon per minute centrifugal waterworks pump was purchased and installed for the municipality for use for domestic and fire service. This installation also included a Venturi meter and the necessary piping and other details. The pump is direct connected to a 350 horse-power, 2,200-volt, 3-phase synchronous motor, which together with the street railway synchronous motors are used for power factor correction purposes.

The Commission also constructed for the municipality several 2,200-volt lines, including a line to the Penitentiary and Portsmouth and a line between the substation and the pump house.

#### Distributing Station

Alterations were effected and necessary equipment installed in the easterly part of the Kingston Civic Utilities steam plant so that power was turned on during December, 1917. A temporary wooden switch board was installed to supply 2,400-volt power to the Civic Utilities bus.

During the spring of 1918 the 44,000-volt lightning arrester and the permanent low tension switchboard were installed and put in service. The equipment is described in the last Report.



Kingston waterworks. Addition to pumping plant and proposed development.

### Municipal Waterworks Pumping

The 3,500 g.p.m. unit and connections described in last year's report have been in operation for several months. Arrangements have been made to test this unit under operating conditions. Photograph number 10960 shows the pump and synchronous motor. Drawing No. MC 308-7-5 shows the arrangement of piping in this plant. The piping was revised, enlarged and duplicated from point near end of dock to Ontario street.

### Construction

The Commission installed for this municipality overhead 2,300-volt feeders from Kingston to Portsmouth and from the Kingston sub-station to the Kingston waterworks. This work was completed on June 12, 1918.

### Madoc

Mining activity has caused a considerable increase in the demand on this station. A number of new mines have been opened up, all of these using Hydro-Electric power for drilling, pumping and hoisting. Most of the mines are operated for fluorspar.

### Napanee

At the request of the municipality plans and estimates were made by the Commission for a new system of street lighting.

### Omeme

The distribution system constructed for the Village of Omeme by the Commission was completed and placed in service on January 17, 1918.

The power load has grown rapidly during the year and considerable further increase is expected during 1919.

### Distributing Station

The outdoor distributing station at Omeme was completed and put in service about the middle of January, 1918, and was operated until March with two 40-kv.-a., 44,000/2,400-volt transformers at which time the third transformer was completed and installed.

A 44,000-volt Delta Star lightning arrester is used to protect the high tension circuits.

### Street Lighting

The installation of a new street lighting system was completed and service given on January 18, 1918. The equipment included a  $7\frac{1}{2}$ -kw. pole-type constant-current transformer, the lighting units consisting of thirty-two 100-watt and ten 250-watt gas-filled incandescent lamps, mounted in standard bracket fixtures.

### Oshawa

#### Gas Plant

A similar equipment to that described for Cobourg is being installed for the gas holder tank, which is sunk in the ground and therefore is easier to maintain in satisfactory condition in winter than the exposed steel tank at Cobourg.

Owing to the uncertainty of coal deliveries, the necessity of storing large quantities in the yard and the expense of unloading and handling to the generators, special gangways have been erected to the charging platform and an unloading conveyor is being built to deliver the coal from a pit below the railway track to the storage pile.



## Peterborough

### Distributing Station

Due to the high cost of material and labor it has been deemed advisable to postpone the building of the new distributing station mentioned in the last Annual Report. To meet the load conditions for the present one 750-kv-a., 6,600/2,400-volt, 60-cycle, 3-phase transformer was temporarily installed at the Otonabee Distributing Station.

### Street Railway

The work in connection with a report on operating conditions, new routes, etc., was carried on; the Commission has authorized the purchase of 2 one-man cars while tenders and specifications are now being prepared. A complete report, showing the comparative service in Peterborough and other similar Ontario cities, was laid before the Commission, which indicated that the service given in Peterborough both as to length of track and car mileage per capita was much better than that supplied in other places having corresponding conditions. The earnings were found to be too small to warrant any further extensions at this particular time and it can easily be seen that any further extensions would not be self-supporting, but when the two new cars are placed in operation, it is anticipated that the present routing may be altered so as to give some improvement in the service.

### Radial Railway

One 150-kw. generator was purchased from the Essex County System to be used as a synchronous motor to drive the present 100-kw., 500-volt direct-current generator. The installation of this equipment is being done by the Operating Department.

### Gas Plant

The new water gas plant described in the previous report is now in satisfactory operation. This equipment includes condensing capacity sufficient for both the old and new generators and the old scrubbers have been dismantled.

## Pickering Township

A 4,000-volt line has been constructed through Pickering Township to Greenwood from the West Whitby township extension.

Two power contracts and several lighting contracts have been secured.

## Picton

The lines and stations for Prince Edward County are well under way and power will be delivered to Picton early in 1919.

The low tension switching panels and metering equipment will be housed in a small brick kiosk.

The 2,200-volt, 2-phase, three-wire distribution system in the town will be rearranged for three-phase, 2,200-volt operation.

The Commission is arranging for the installation of electrically-driven pumps for the Picton waterworks system. Two 600 gallon per minute, 3 stage, 6-inch centrifugal pumps will be installed and will be driven by two 100 horse-power motors.

Contracts have been let for this equipment and the work is progressing favorably.

### Distributing Station

Drawings have been prepared and material ordered for a pole type station. The Canadian General Electric Company were awarded the contract for the 300-kv-a., oil insulated, self-cooled, outdoor type, 3-phase, 60-cycle, 44,000/2,400-4,160-volt transformer, which was to be so designed as to operate satisfactorily in parallel with similar transformers supplied by them for the Central Ontario System. The air brake switches, choke coils, and arresters were supplied by the Delta-Star Electric Company.

The meter house is of brick construction and with the exception of the installing of the power transformer which is to be done by the Canadian General Electric Company, the Commission's Construction Department will build this station.

This station will receive its power from the 44,000-volt line of the Central Ontario System, from Trenton. The low tension distribution is to be 2,400-volt and there are to be two feeders one of which will belong to the municipality.

From present indications this station will be complete and in service in the early part of 1919.

### Municipal Waterworks Pumping

A recommendation has been made covering the substitution of electric pumping equipment for the present steam plant, which gives a water supply for fire and commercial purposes. Tenders have been called for on two units each of 600 g.p.m. capacity at 335 feet head for fire service, the same units operating at their best efficiency at 290 feet head and giving a greater volume of water for commercial service. A large existing reservoir at suitable elevation for the lower pressure allows of off-peak operation.

### Sulphide

During this year the proposed extension to the station building has been completed. Five feet has been added to its length to take care of the additional switching equipment.

New remote control low tension switching equipment and a 6-panel switchboard to replace that which is installed at present has been ordered from the Canadian Westinghouse Company and it is expected that it will be ready for service early in 1919.

### Trenton

The demand of the British Chemicals Company increased to nearly 6,000 horse-power. This plant manufactured explosives for the Imperial Munitions Board and is now idle since the signing of the armistice.

The waterworks system has been sold to the municipality and will be operated as a civic utility by a local commission after December 31, 1918.

### Tweed

The street lighting constant-current regulator is being removed from the old hydraulic plant and installed on a pole structure in the centre of the town. The circuits will be controlled by a time-switch.

The distribution system is undergoing a general overhauling.

### Uxbridge

A valuation of the local power plant and distribution system in the town, the property of J. W. Gould, Esq., was made by the Commission. The municipality is preparing to submit a by-law for the purpose of taking over this plant and operating same until a supply of Hydro power is available.

### Wellington

The village of Wellington is arranging to take over the 250-volt d.c. distribution system and operate same at 220 volts until the summer of 1919, when the whole system will be completely rebuilt for 3-phase, 4,000 volts.

#### Distributing Station

In April of this year instructions were issued authorizing the construction of this station and on May 11, 1918 the Canadian General Electric Company were advised to proceed with the building of one 300-kv-a., oil insulated, self-cooled, outdoor type, 3-phase, 60-syce, 44,000/2,400/4,160-volt transformer which was to be so designed that it would operate satisfactorily in parallel with similar transformers supplied by them for the Central Ontario System.

The station will be of the outdoor type with 44,000-volt air brake switches, choke coils and arresters. It will receive its supply of power from Trenton. The meter house is built of brick.

The low tension distribution consists of two 4,160-volt, 3-phase, grounded neutral feeders one of which supplies Bloomfield.

The Commission's Construction Department is installing this station complete with the exception of the power transformer which the Canadian General Electric Company will install.

The work is proceeding very satisfactorily and it is expected that the station will be in service early in 1919.

### East and West Whitby Township

The 4,000-volt rural extension from Oshawa through Whitby Township has been completed.

Apart from the village of Brooklin, thirty farm power services and ten lighting services have been connected.

### Whitby

A portion of the distribution system in this municipality was formerly controlled and operated by the Commission and from these lines service was supplied to two power consumers. Arrangements were completed under which the Whitby Public Utilities Commission took over the lines in question and assumed the two power contracts.

Power has been supplied continuously throughout the year to the Military Hospital.

#### Street Railway

As recorded in the last Annual Report, there was an agitation for the construction of a street railway in Whitby to give service between the C.P.R. and the Military Hospital. An estimate of the cost of construction and operation of this line along with an estimate of the probable operating revenue was forwarded to the municipality on December 17, 1917, but it was found impossible to secure sufficient business to make the construction of the line a feasible proposition. A small construction locomotive has been purchased and restricted service is now given between the G.T.R. station and the hospital grounds.

## MUSKOKA SYSTEM

### POWER CONSTRUCTION

#### South Falls Generating Station

The two graphic meter panels and the Tirrill regulator which were ordered from the Canadian General Electric Company as noted in last Report, were installed by this Company in November, 1917, and February, 1918, respectively.

### MUNICIPAL WORK

Assistance was given to the municipalities of Huntsville and Gravenhurst in the nature of engineering advice, explanation to customers concerning application of rates, and in general on matters relating to the operation and management of their respective distribution systems, and periodical trips were made by engineers of the Department to each of these municipalities for such purposes.

#### Huntsville

The town officials requested a valuation of the local waterworks system so that a proper figure could be arrived at covering the value of their permanent assets. This valuation is now being made.

#### Stephenson Township

Plans and estimates were prepared, and an investigation made concerning the delivery of power to the hamlets of Utterson and Port Sydney, located within the boundaries of Stephenson Township, and all matters discussed and explained to the township officials concerning the delivery of Hydro power to this locality.

## ST. LAWRENCE SYSTEM

### GENERAL

#### St. Lawrence River Surveys

The collection of data on the water powers of the St. Lawrence River was commenced during the year and is being continued. This embraces extensive surveys in the field for the collection of topographical and hydrographical data, the extent of which may be judged from the fact that the St. Lawrence River has a discharge varying from 180,000 to 325,000 cubic feet per second and has a fall of ninety feet in that part of it above or west of the International or Interprovincial boundary, from Lake Ontario, to below Cornwall.

The original intention of limiting the investigation to that part of the river from Morrisburg west to Lake Ontario water level has been altered so that the investigations will include all that part of the river in which the Province of Ontario is directly interested in power; embracing fifty miles of the canalized part of the St. Lawrence.

The work was started at the end of May, 1918, when steps were taken to determine with the least loss of time the best location for the installation of gauges that would define the water surface of the river at its varying stages. This was followed by the establishment of a staff of engineers at Morrisburg, for



systematically securing the necessary knowledge. Three automatic gauges have been installed on this work and kept in operation and six more are on order and will be installed on the receipt of the same.

The surveys now being conducted have for their object the determination of contours of the shores between the head of the Galops Rapids and the lower end of the Long Sault Rapids. These contours will give the necessary information for determining the most feasible locations of sites for dams and the attendant flooding of lands due to backwater from these dams. Wash borings and core drillings are being made at these possible sites.

The results of these topographical, hydrographical and geological surveys will furnish the data for an adequate analysis of the most economic and practicable method of developing the potential powers of the St. Lawrence River, and will enable the Province to participate with authority and intelligence in the discussion of the proposed scheme of international development, which has recently become such an active issue.

## MUNICIPAL WORK

### Athens

A request was received from the municipality for assistance in securing a supply of Hydro power. An engineer visited the village and secured necessary data to include this district in estimates for transmission lines, as soon as a surplus of power is available on the St. Lawrence System.

### Brockville

#### Distributing Station

Owing to the increasing demand for power, the three 200-kv-a., single-phase transformers in the original station were replaced by two 750-kv-a., oil insulated, water cooled, 3-phase, 44,000/25,400-2,400 4,160-volt Canadian General Electric transformers with a 450-kv-a., self-cooled rating. One of these was placed in service on October 23, 1918, the other is to be installed shortly.

The present one panel switchboard is to be moved and four new panels are to be installed. Two of these are to be owned by the municipality. The high tension switching equipment has also been somewhat remodelled. The present high tension voltage is 26,400 volts.

When the system voltage is changed to the 44,000 volts a new station will be built.

#### Municipal Pumping Station

A visit was made to the pumping station at the request of the municipality and a proposition is being prepared for increasing the present electric pumping plant and cutting out the steam plant, for both domestic and fire purposes. It is proposed to instal two electrically-driven domestic pumps and one fire booster pump.

#### Gas Plant

An examination of the municipal gas plant was made for the purpose of ascertaining whether the equipment and operation were in accordance with modern practice, and a report was submitted to the manager of the City Utilities.

### Chesterville

Due to load conditions at Chesterville it has been decided to install a 26,000-volt outdoor transformer station of 300-kv-a. capacity which can be changed to 46,000 volts when the St. Lawrence System is changed over to the higher voltage. At present Chesterville is supplied by a 4,000-volt feeder from Winchester and this will be done away with when the new station goes into service which will be sometime in the Spring of 1919.

The power load has increased to such an extent that the Commission is preparing to instal an outdoor substation at this point. A suitable site for same has been purchased by the municipality and arrangements are being made for the purchase of one 300-kw., 3-phase outdoor transformer and protective equipment.

### Cornwall

#### Transformer Station

Outgoing lines will be operated at 26,400 volts until load conditions warrant a change to 45,700 volts.

Plans and specifications for the building of the transformer station were completed early in the spring. The erection of the building, which is 52 feet by 67 feet and situated near Mille Roches between the Cornwall Canal and the Kingston Road, was started by the Commission's Construction Department in May and completed in October. It is built of buff colored pressed brick. Steel window sashes, reinforced concrete floors and steel beam construction were used throughout, thus making an entirely fireproof building.

The contract for the steel was awarded to McGregor & McIntyre, Limited. The building has been so designed that an addition may readily be added when it becomes necessary to increase the capacity of the station.

#### Electrical Equipment

The electrical equipment will consist of two incoming 110,000-volt lines with an oil switch on each line, 4 single-phase, 1,250-kv-a., 60-cycle, 63,500/45,700/26,400-volt water-cooled transformers having one 110,000-volt lightning arrester on the high tension bus, switching and protective apparatus for two 46,000-volt outgoing lines and three 100-kv-a., 60-cycle, 45,700/26,400 primary 4,000/2,300/575-volt secondary service transformers.

The station is to be operated at present at 110,000 volts and 26,000 volts but provision has been made so that the station can be operated at 46,000 volts on the low tension side at a future date. The 46,000-volt equipment and service transformers are located on the second floor, the main transformers and 110,000-volt switching equipment on the main floor.

The incoming line oil switches were purchased from the Canadian General Electric Company on a stock order from which two were allotted to this station. Contracts were placed with the Canadian General Electric Company for four 1,250-kv-a., 110,000-volt transformers and three 100-kv-a. service transformers. A contract was also placed with the Canadian Westinghouse Company for the 110,000-volt lightning arrester. A number of 46,000-volt oil switches were purchased from the Canadian Westinghouse Company on a stock order and two of them were allotted to this station.

The switching equipment is to be hand operated but with automatic trip. Provision has been made so that this equipment may be made electrically operated in the future. Three 1,250-kv-a. transformers will comprise one bank and the

fourth unit will be used as a spare. A complete lighting and electric heating system is being provided for the station.

The installation work of the above equipment was started by the Commission's Construction Department the last of October, 1918, and it is expected that the station will be ready for service early in 1919.

#### General

A 15-ton hand operated crane and a 5-ton chain block purchased from the Northern Crane Works have been provided for the handling of the apparatus in the station.

Two 100-gallon centrifugal pumps direct connected to 550-volt induction motors have been purchased from the Canadian Fairbanks Morse Company for the pumping of water from the Cornwall Canal for the purpose of cooling the transformers, etc.

#### Cornwall-Morrisburg Line

A 44,000-volt transmission line has been completed between the new substation at Cornwall and the St. Lawrence System lines at Morrisburg.

This line carries No. 3/0 aluminum conductors on pin type insulators on forty foot poles spaced 176 feet.

Power will be supplied to the St. Lawrence System over this line as soon as the Cornwall substation is completed. Operation will be at 26,400 volts for the present, but will be changed to 44,000 volts as soon as load conditions warrant the change.

#### Toronto Paper Company

During the summer a request was received from the Toronto Paper Company at Cornwall, for 600-volt power. A modified type "G" station was decided on and designs are being completed. The present layout calls for one 26,000-volt line with one 750-kv-a. transformer and room for a second transformer. The station is so designed that it can be readily changed to be suitable for 46,000 volts with two incoming lines and an extension for two more transformers. Power will be supplied from the Cornwall Transformer Station.

#### Iroquois

Assistance was given to the municipality, the Commission supplying a 150-kw., 3-phase, 60-cycle generator for temporary use until the municipality's new equipment could be installed.

#### Winchester

Consideration was given to alterations in the substation serving this municipality.

Tests were made of a local industry contemplating changing to electric drive. The load taken by the town will be materially increased by this industry.

## OTTAWA SYSTEM

### MUNICIPAL WORK

#### Ottawa

An investigation of rates for street lighting was made with a view to adjusting rates charged for ornamental lighting, with the result that a new reduced rate was put in force for ornamental street lighting.

The Lemieux Island pumping station was put into service on November 12, 1917, and was served by means of Hydro power.

The metering arrangements for measuring the power supplied to the city from the Ottawa and Hull Power and Mfg. Company were improved and new meters installed.

#### Nepean Township

Suburban hamlets and municipalities in Nepean Township, including Westboro, requested the Commission to investigate the possibility of serving them with Hydro power. Visits were made to these districts and reported on.

## RIDEAU SYSTEM

### POWER CONSTRUCTION

#### High Falls

The extension of the Rideau System in eastern Ontario in the past year has required the development of an additional source of power. Investigation indicated that High Falls, on the Mississippi River, about half a mile above Dalhousie Lake, would provide the capacity required, in the most economical way. This site is about seven miles from Mississippi Station, on the Kingston-Pembroke branch of the Canadian Pacific Railway.

During the summer of 1918 a complete survey was made of the proposed development site at High Falls and also of the area to be flooded. These surveys have been plotted and plans for the development are in course of preparation.

The scheme of development adopted is to raise the water level of the river by means of a dam across the head of the falls which will make available a head of 80 feet, and create a storage to facilitate the handling of daily load variations. The pipe line will be of wood stave 10 feet in diameter and 320 feet long and will carry the water to the power house.

The turbines, three in number, were purchased along with the generators and governors from the Hannawa Falls Power Company of Potsdam, New York. These machines are rated at 1,200 brake horse-power each, running at 300 r.p.m. under an 80-foot head, and were built by the James Leffel Company, of Springfield, Massachusetts. They have been in service for several years, but a close inspection shows that with some minor repairs they can be put in good running condition. The site of the dam and power house are being cleared and a roadway opened up by the Construction Department. No contracts for equipment or material other than above mentioned have been let as yet, but it is expected that tenders will be called for early in 1919 for the pipe, gates, winches, steel and other apparatus necessary for the completion of the work.



### Rideau Power Company

Metering equipment was installed in the plant of the Rideau Power Company to measure the power purchased for the Rideau System.

This equipment includes graphic recording wattmeter and wattless component meter, also an integrating wattmeter, ammeter, potential and current transformers and miscellaneous equipment.

The Rideau Power Company transforming and switching station was designed by the Commission. Apparatus for the station was purchased through the Commission. Additional generating equipment is also being installed.

## MUNICIPAL WORK

### Almonte

An effort is being made to have the several water power plants in the municipality incorporated into a single development. Engineering assistance was given to the municipality in the operation of the local system and in the construction of line extensions for power loads recently secured.

### Carleton Place

Options have been secured by the municipality with a view to the purchase of the local power plant and distribution system. It is proposed to use this plant in connection with a comprehensive power scheme for the Rideau System. This municipality will shortly vote on Hydro by-laws.

### Kemptville

Estimates were prepared, including Kemptville in a proposed power scheme for the Rideau district.

Since an agreement has been executed with the Rideau Power Company of Merrickville, an adequate supply for this municipality is available at that point. It has been considered necessary to delay any work for serving the municipality until more favorable costs of labor and material prevail. It is proposed to make arrangements to serve the municipality during the coming year.

### Perth

The 26,000-volt transmission line from Smith's Falls to Perth has been completed. The brick substation at the site of the town pumping station is under construction. Three 200-kv.a. transformers now in Brockville station are to be installed in this station.

Power will be delivered from Merrickville early in 1919.

A 60 horse-power, 3-phase, 2,200-volt motor was procured by the Commission and direct-connected to the 6-inch single stage domestic pump in the municipal pumping station.

A 125-h.p., 3-phase, 2,200-volt motor was purchased for direct connection to the 8-inch turbine fire pump.

A 200-kw., 3-phase, 60-cycle, 2,200-volt generator was purchased for the Badour power house, one of the town's generating plants.

A 200-kw., 3-phase, 60-cycle, 2,200 volt generator was purchased for the Tay River power house.

About five hundred 133-cycle meters are being readjusted at the Commission's laboratory, Toronto, for use on 60-cycles.

The local distribution and street systems have been remodelled and extended under the direction of the Commission to serve industrial plants preparing to take electric power.

A number of tests were made on industrial plants to obtain the amount of power needed for electric drive.

The Commission has been requested to design and purchase suitable switching equipment for the municipality to be installed in the substation. This will consist of four panels, and delivery is expected shortly.

#### Distributing Station

The construction of a modified Type "G" station was decided on. It will be a brick building and will accommodate two 750-kv-a., oil insulated, water-cooled, 44,000/25,400 volts primary 2,400/600 volts secondary, 60-cycle transformers together with necessary switching equipment. Three 200-kv-a., oil insulated, self-cooled transformers will be installed temporarily. Arrangements have been made so as to extend the building if necessary. It is expected that this station will go into service early in 1919.

The construction work on this station was commenced in the first week in September, and completed by October 8th.

#### Municipal Switchboard

The Perth municipality has authorized the Commission to purchase a four-panel switchboard for controlling the outgoing distributing feeders. Specifications have been drawn up and a contract for this switchboard was given to the Canadian Westinghouse Company on September 18, 1918.

#### Street Lighting

Plans and estimates were prepared for the installation of street lighting system, partly underground and partly overhead, to replace the existing obsolete arc lamp system.

#### Smith's Falls

The plants and distribution systems of the Smith's Falls Electric Company and the Citizens' Electric Company were taken over by the municipality and operated as a single system, effecting thereby a considerably greater overall efficiency in the use of water power, distribution lines, etc.

A part of the Gould power plant was arranged as a step-down station for power from Merrickville.

The municipality requested the Commission to design and purchase switching equipment for the substation to allow of operating the local plants in conjunction with Hydro power from the Rideau System.

#### Distributing Station

The building provided for a distributing station for the municipality was remodelled in order to obtain a more satisfactory layout at the present time and to have sufficient clearances to install the high tension for 44,000 volts, when this system is changed over to 44,000 volts from 25,400 volts.

One 750-kv-a., oil insulated, water-cooled, 3-phase, 44,000/25,400/2,400-4,160 Canadian General Electric transformer with a 450-kv-a., self-cooled rating was placed in service with a temporary switchboard on September 15, 1918. Provision has been made so that a duplicate transformer may be installed in the future.

A permanent switchboard is to be designed and will include a six panel feeder and generator switchboard which will be purchased by the Smith's Falls municipality, through the Commission. It is expected that the complete switchboard will be installed the early part of 1919.

Power is supplied from Merrickville at present at 25,400 volts.

This source of power will be augmented when the High Falls Development is completed.

#### **Municipal Waterworks Pumping**

The present water supply is obtained from hydraulically-operated reciprocating pumps, an open wooden flume on the Rideau River furnishing power and giving a suction head on the pumps. The flume being in a bad state of repair and of insufficient capacity, a report and layout were made for auxiliary electric pumping equipment to be located in the present pumping station for domestic and fire service.

Tenders have been received on two direct connected domestic units each of 1,000 g.p.m. capacity at 175 feet head with a booster on a by-pass in the discharge main which will raise the pressure 95 feet for fire service, provision being made in the layout for a second booster in parallel with the first. When the electric installation is placed in operation, the flume can be rebuilt and most of the supply for domestic service will be pumped by water power, the electric units being reserved for fire and for domestic demand above the capacity of the present plant. This demand is at present filled by steam pumps of low duty which will be permanently closed down.

## **NIPISSING SYSTEM**

### **POWER CONSTRUCTION**

#### **Nipissing Generating Station**

The old wooden surge tank was removed from the pipe line at Nipissing generating station, the new differential steel tank giving much improved service. A new set of bayonet type electric heating units is to be installed in the surge tank to prevent the water from freezing during cold weather.

The armature of No. 3 generator was completely rewound and service from this machine is much improved.

A demand meter was installed to measure the load on the Nipissing village feeder.

Preparations have been made for the installation of a storage dam in the vicinity of Cox Chutes on the South River as soon as prices of material and labor return to more normal basis. All the necessary land has been secured and the designs have been completed.

## **MUNICIPAL WORK**

#### **Callander**

A single-phase type R.O. demand watt-hour meter was installed in the local sub-station to measure the maximum demand taken by the municipality.

### North Bay

A 200-kw., 2,200-volt, 3-phase generator was installed in the steam generating station. Some rearrangement and a number of repairs were made in the plant to obtain more efficient operation. Engine foundations were improved by the addition of concrete abutments.

Switching apparatus and street lighting transformers were moved from the old gas plant substation to the high tension substation.

Assistance was given to the municipality to re-establish service after the fire in the waterworks pumping station which destroyed the station and some of the apparatus therein. Assistance was also given in the matter of adjustment of the fire loss.

A very satisfactory increase in the appliance load has been noted during the past season, a large number of stoves having been connected to the system.

### Powassan

A 3-phase type R.O. demand meter was installed in the Powassan substation to measure the power taken by the municipality.

Several extensions were made to the distribution system and a satisfactory increase in load recorded. A portion of the distributing system was in extremely bad shape and was rebuilt.

## PORT ARTHUR SYSTEM

### POWER CONSTRUCTION

#### Nipigon Power Development

Surveys of possible power developments on the Nipigon River for the supply of power to Port Arthur, Fort William and the surrounding districts were carried on throughout December and the fall and December of 1917. These investigations showed that there was available a total head of 115 feet, between Lake Jessie and Camp Alexander. The location of this site is about thirteen miles north of Lake Superior and two miles from Cronyn Station on the Canadian Northern Railway. This total development would provide a capacity of 100,000 horse-power, but this amount was considered to be too great for the immediate future requirements of the district. Further investigation revealed that the cheapest and most feasible economical scheme would be to develop this head in two stages, beginning with a 58-foot development at Cameron's Pool. It was, therefore, decided to proceed with this initial development for a capacity of 50,000 horse-power.

The detailed survey of the proposed site of the power house immediately adjacent to Cameron's Pool is now being carried on. Simultaneously with this field work, preliminary studies are being made on the design of the development.

Owing to the remote location of the development a temporary hydraulic plant will be installed to furnish power and light during construction. To this end two of the turbines at present not in use in the Otonabee power plant of the Commission will be removed, overhauled and set up at Cameron's Pool. Plans covering the installation of these wheels are in course of preparation.

Plans are being prepared for the building of a standard gauge railway to connect the site of the development with the C.N.R. at Cronyn Station, by means



of which construction material and equipment can be delivered by rail at the site of the work.

The construction work will be carried out by the forces of the Construction Department of the Commission.

No tenders have been called for in connection with any of the hydraulic equipment, but specifications covering same will be issued early in 1919, in order that the work may be completed in 1920.

## MUNICIPAL WORK

### Port Arthur

An investigation was made concerning the demands for power in this municipality with the idea of determining the possible market available upon delivery of power from the Nipigon development. Engineering advice was given the local officials in connection with the application of Hydro-Electric power to the various elevators in the municipality.

### Fort William

An investigation was made in the municipality of Fort William concerning the possible market of power under conditions which would prevail at the completion of the Nipigon development. An investigation was also made concerning the rates charged to power consumers by the Kaministiquia Power Company, and a report submitted comparing the rates of this company with those which would be in force after delivery of power from the Nipigon development to this municipality.

## ESSEX COUNTY SYSTEM

### POWER CONSTRUCTION

#### Canadian Salt Company Distributing Station

Drawings were prepared in May, 1917 for the installation of electrical equipment on temporary, intermediate and future layouts at this station, the temporary layout being made up to allow for the supply of equipment for power with the least possible delay. Equipment for both temporary and intermediate layouts were placed on order and as shipments arrived simultaneously, the temporary layout was discarded.

Three 750-kv-a., 26,400/176-volt, 25-cycle, single-phase, oil-insulated, water-cooled transformers, mentioned in last Report, were ordered from the Moloney Electric Company in March. Electrical equipment including switching, metering and control apparatus were purchased from the Canadian General Electric Company and the Canadian Westinghouse Company and the switchboard panels from A. H. Winter-Joyner, Limited. This station was placed in service December 9, 1917.

The first installation provided sufficient transformer capacity for the operation of one 2,000-kv-a. rotary converter and was supplied with power over two 26,400-volt lines from Essex Transformer Station.

In April, 1918 an estimate was prepared for the completion of the station in accordance with previous plans. A new bank of transformers identical with those already in service and switching equipment for supplying power to No. 2 Rotary converter was decided upon.

The Moloney Electric Company was awarded the contract June 11, 1918, for the new bank of three 750-kv-a. power transformers.

Switchboard panels were purchased from A. H. Winter-Joyner, Limited, and switching equipment, metering and control apparatus from the Canadian General Electric Company and the Canadian Westinghouse Company. The greater part of this equipment is now delivered, and is being installed by the Construction Department of the Commission. The new equipment will be installed and ready for service the latter part of January, 1919.

## MUNICIPAL WORK

This system was recently purchased from the Essex County Light and Power Company and at present 60-cycle power is being supplied to it by the Canadian Salt Company at Sandwich, Ontario. Arrangements are being made to change this Essex County System over to 25-cycle and to feed it from Essex Transformer Station at 26,400 volts. On this Essex County System there are seven sub-stations, one at each of the following places: Amherstburg, Kingsville, Leamington, Essex, Harrow, Cottam and Canard River.

### Amherstburg

This is a brick building 24 feet wide by 27 feet long by 18 feet high, inside dimensions. This station has one incoming and one outgoing 22,000-volt line and the power is transformed to 2,300 volts and fed out over one power feeder, one commercial lighting feeder, and one street lighting feeder. Each line is equipped with an electrolytic lightning arrester, and a "K-21" non-automatic oil switch which connects on to a single bus. The transformers are connected to this bus through a non-automatic "K-21" oil switch. The transformer bank consists of three 100-kv-a., 23,000/40,000 Y primary, 2,400/4,800 volts secondary, 60-cycle, single-phase General Electric Company's transformers. On the secondary of these transformers there is connected one 30-kilowatt, 3-phase induction regulator which regulates the entire load on this station. These transformers and the regulator are to be removed and it is expected that they will be required in the near future on one of the 60-cycle systems under control of the Commission. This station was first placed in service on January 21, 1914.

Three 100-kv-a. 26,400/2,300-volt, 25-cycle, oil insulated, self cooled, single-phase transformers have been purchased from the Packard Electric Company, of St. Catharines, Ontario, and are to be shipped early in November. In the new installation the potential regulator will be omitted, disconnecting switches will be installed between each incoming line and the lightning arresters, the non-automatic oil switch on the high tension side of the transformers will be made automatic through current transformers and Condit Type "A" relays. The secondary of the 100-kv-a. transformers and also the outgoing feeders will be changed from 2,300-volt delta to 4,000-volt Y, 3-phase, 4-wire, with the neutral grounded. Metering equipment together with the standard testing arrangement will be installed in order to meet the Commission's requirements. Arrangements are being made to have the 100-kv-a. transformers installed before January 1, 1919, and to make the remaining changes early in 1919.

### Canard River

This is a pole type station with one incoming 22,000-volt line and one outgoing 2,200-volt feeder. The high tension is controlled by disconnecting switch fuses and has improvised choke coils. The transformers consist of two General Electric 60-cycle, single-phase, 10-kv-a., 22,000/2,200-volt outdoor type transformers. The low tension has 2,200-volt porcelain fuse plugs with General Electric compression type lightning arresters. This station was placed in service by the Essex County Light and Power Company late in 1914.

On September 24th an order was placed with the Moloney Electric Company for one 25-kv-a. 26,400 primary, 230/115-volt three-wire secondary, 25-cycle, single-phase, outdoor type transformer which is to be delivered to this station on or before December 4, 1918. The present transformers will be removed for future use on one of the Commission's 60-cycle systems. It is expected that the new transformer will be installed before January 1, 1919, and that early in 1919 the necessary metering equipment will be installed. Metering equipment for this station will consist of a Westinghouse type "R.A." maximum demand graphic watt-hour meter with outdoor current transformers. The meter, together with its test links, etc., will be installed in a meter box approximately 18 by 23 by 33 inches erected on a pole supporting the transformer.

### Cottam

This is a pole type station with one incoming 22,000-volt line and one outgoing 2,200-volt, three-phase feeder. The high tension line equipment consists of General Electric type expulsion fuses, with plain disconnecting switches having improvised horn gaps and with improvised choke coils. The one transformer is 25-kv-a., 60-cycle, single-phase, 22,000/2,200-volt, made by the General Electric Company. The low tension feeder is controlled by special low tension fuses made up by the Detroit Edison Electric Company. This station was placed in service late in 1915 by the Essex County Light and Power Company.

On September 24th an order was placed with the Moloney Electric Company for one 25-kv-a., 26,400/13,200-volt primary 230/115-volt three-wire secondary, 25-cycle, single-phase, outdoor type transformer to be delivered to this station on or before December 4, 1918. The present transformer will be removed for future use on one or other of the Commission's 60-cycle systems. It is expected that the new 25-kv-a. transformer will be installed on or before January 1, 1919. Early in January the necessary metering equipment will be installed for this station and will consist of a Canadian Westinghouse Company type "R.A." maximum demand graphic watt-hour meter together with outdoor current transformers. The meter together with its necessary testing equipment will be installed in a small meter box 18 inches deep by 23 inches by 33 inches erected on the pole supporting the transformer.

### Essex

This is an outdoor pole type station fed by one incoming 22,000-volt line with General Electric airbreak switches and fuses and improvised choke coils feeding three 50-kv-a. 23,000/2,300-volt, 60-cycle, single-phase, General Electric transformers from which the power is fed over one 2,300-volt, three-phase feeder protected by General Electric compression type arresters with no switches or metering. This station was placed in service on October 29, 1914.

These transformers are to be removed for use on one of the Commission's 60-cycle systems. On August 21st an order was placed with the Moloney Electric

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Company for one 75-kv-a., 26,400 and 13,200-volt primary 2,300-volt secondary, 25-cycle, 3-phase, oil insulated, self cooled, outdoor type transformer for this station and this transformer was promised for shipment on October 2nd. The present transformers are installed with their bases about 18 feet from the ground whereas arrangements are being made to install the new 75-kv-a., 3-phase transformers about eight feet from the ground. It is also arranged to meter the load on this station on the 2,300-volt side by means of current and potential transformers, with a Westinghouse type "R.A." maximum demand recording watthour meter installed in one of our standard meter houses beside the structure. It is expected that these transformers will be exchanged before January 1, 1919, and that the metering equipment will be installed early in 1919.

### Harrow

This is a pole type station with one incoming 22,000-volt line and one outgoing 2,200-volt feeder. The incoming line is equipped with General Electric air breaker switches and fuses and with improvised choke coils. The transformers consist of three 25-kv-a., 60-cycle, single-phase, 22,000/2,200-volt General Electric outdoor type transformers. This station was first placed in service on January 21, 1914.

An order was placed with the Moloney Electric Company on August 21, 1918, for one 75-kv-a., 26,400/2,300-volt, 25-cycle, 3-phase, oil insulated, self cooled, outdoor type transformer for this station to be delivered on or before October 2, 1918. The present 60-cycle transformers will be removed for future use on one of the Commission's 60-cycle systems. Arrangements are being made to instal the new transformers, before January 1, 1919 and early in 1919 a standard meter house together with necessary current and potential transformers for one Westinghouse type "R.A." maximum demand graphic watthour meter will be installed.

### Kingsville

This is a brick building 24 feet by 26 feet by 18 feet high inside dimensions. This station has one incoming and one outgoing 22,000-volt line connected to a bus which feeds through three 100-kilowatt, 22,000 volts primary, 2,200-volt secondary, 60-cycle, General Electric transformers and one 30-kilowatt General Electric potential regulator to a 4,000-volt bus, from which power is fed out over one power feeder, one commercial lighting feeder and one street lighting feeder. The incoming lines enter this station through roof entrance bushings and have General Electric electrolytic arresters and are connected direct to the high tension bus through disconnecting switches. The high tension bus is connected through a General Electric K-21 non-automatic oil switch to the transformers. This station was placed in service on January 21, 1914.

Arrangements have been made to remove the three 100-kv-a. transformers and use them on one of the 60-cycle systems under control of the Commission or elsewhere. Three 75-kv-a., 26,400/2,300-volt, single-phase, 25-cycle, Canadian Westinghouse Company's transformers are being removed from Burford Distributing Station and will be installed in this station. When this station is changed over to 25-cycle the potential regulator will be omitted, disconnecting switches will be installed in the connections between incoming lines and the electrolytic lightning arresters and the K-21 oil switch will be made automatic through current transformers and Condit Type "A" Relays. The service transformers will be exchanged for 25-cycle transformers and the necessary metering together with the testing equipment for same will be installed to meet the requirements of the Commission.



### Leamington

This is an outdoor station having a steel structure, with the transformers mounted about 10 feet above the ground. It includes one incoming 22,000-volt line together with transformers and one outgoing 4,000-volt, three-phase, four-wire feeder. The incoming line is controlled by one air break switch and has choke coils and fused horn gaps. The three transformers were manufactured by the Westinghouse Electric Manufacturing Company, Pittsburgh, Pennsylvania, and are 100-kv-a., single-phase, 60-cycle, oil insulated, self cooled with a 23,000 primary and a 2,300-volt secondary. This station was placed in service by the Essex County Light and Power Company, August 30, 1915.

Arrangements are being made to move this steel structure to a new location adjacent to the Leamington Power House in which the metering equipment will be installed and the low tension 4,000-volt feeders will be controlled. On August 26th, an order was placed with the Canadian Crocker Wheeler Company, St. Catharines, Ontario, for three 75-kv-a., 26,400-volt primary, 2,300-volt delta 4,000-volt Y secondary oil insulated, self cooled, single-phase, 25-cycle, outdoor type transformers and these are due for delivery early in November. It is proposed to meter the load on this station with a type "R.A." Westinghouse Maximum Demand Graphic Watthour meter.

## SECTION V

### GENERAL ACTIVITIES OF THE COMMISSION

#### ELECTRICAL INSPECTION

Inspection covering all classes of inside electrical construction work is now well organized and in effective operation throughout practically the entire Province of Ontario, probably the most extensive system of its kind, under one administration.

One of the great difficulties in operating over such a large area, embracing so many remote points, is to prevent delay, with its consequent financial loss and serious inconvenience, especially to householders, and no little apprehension was expressed on this score when the system of inspection was first promulgated.

Under the present law no firm, corporation or individual is permitted to commence any electrical work, whether new jobs or the altering of existing installations, until a permit has been first obtained from the nearest authorized electrical inspector. It was the obtaining of this permit which provoked most of the apprehension referred to, but the Commission has completely met the difficulty in a thoroughly satisfactory and effective manner.

The Commission's inspection districts are now located all over the Province in such a way as to enable inspectors to reach installations in a reasonable time (see map of districts appended), if properly notified as required by the rules and regulations, and it is safe to state that practically all work which is undertaken in this Province is known to the Commission's Inspection Department and receives proper attention and inspection before current can be supplied, and in all cases where wilful violations of these regulations have been brought before magistrates the rules have been strongly upheld and seem to be considered by them as highly necessary to safeguard the general public.

The rules and regulations of the Commission in respect to open switches are in advance of the majority of regulations which are in use in other provinces and most of the United States, prominent among which is the regulation requiring that switches which were heretofore permitted by such other regulations to be installed open, are required in Ontario to be of the iron-clad type operated by a handle on the outside, making it impossible to inadvertently come in contact with any live parts. This regulation has since been recommended by the Bureau of Standards of the United States and adopted by the State of California, being also a live issue in various other inspection districts in both Canada and the United States, and is being generally adopted by the latter.

At the close of the last fiscal year arrangements had not been completed for a thorough inspection or control of electrical fittings and material. During the past year, however, this work has been thoroughly organized and taken care of by the Laboratory. The standardization and approval of electrical fittings and material was very much needed, and unapproved and doubtful fittings and material are now being quickly eliminated, and by close co-operation of the Laboratory and Inspection Department they are jointly succeeding in bringing about a proper standard in this Province.

During the past it has been possible for any firm or individual to dispose of fittings such as heaters, wire, sockets, fixtures, etc., whether they were of an approved type or otherwise, with the result that the market was quickly flooded with material of not only a doubtful but in some cases decidedly dangerous character.

In addition to the foregoing we were confronted with a very great evil which has likewise confronted inspection departments all over this continent, and that is the pernicious method of wrongfully advertising the use of various electrical devices. This consists chiefly in advertising that heaters, regardless of their rating or current consumption, may be used on any key socket. This is an attempt on the part of the vendors of such apparatus to encourage their sales by conveying the impression to the purchasing public that it is not necessary to do any wiring, whereas it has been found all over the continent that in a large majority of cases it is dangerous to attach such devices to sockets, and special wiring is necessary.

The rules and regulations now require that cartons, labels and other advertising matter, rather than wrongfully instructing the general public, carry with them correct instructions, and we furthermore find that the same general public is just as willing to install these devices properly as to do it wrongly. This form of pernicious advertising has been in vogue all over the American continent, and various ways and means of meeting the situation have been proposed, but the Commission's recent amendment to the rules and regulations seems to be the first positive step which has been taken by any Inspection Department to make the evil practice which has thus been carried on an offence punishable by law.

At the close of the present year the law is being enforced, and although considerable difficulty was experienced at the outset, it is becoming rapidly understood by all vendors and users throughout the Province.

At this point it might be in order to allude to the difficulty which the Commission encounters at the present time in bringing about changes in bad installations. All such changes involve more or less expense, in some cases very serious expense, and owing to the very abnormal price of labor and material it is often difficult to convince responsible parties that changes of this kind are warranted. In many instances electrical defects are not so glaring, and the danger, while present, is more remote and difficult to explain. In all cases, however, great care and consideration is extended to owners of buildings in enforcing demands for re-wiring or altering existing installations, and it is only where danger is very much in evidence that drastic orders are resorted to. Generally speaking, however, it has been found that the owners of buildings cheerfully respond to the Commission demands for necessary improvements, and while it is to be expected that unreasonable people will be encountered and difficulty experienced in handling some cases, the net result has been very satisfactory. This is borne out by reference to the figures contained in this report, which show that during the past fiscal year there has been the sum of \$223,900.61 expended in remedying defective wiring. These figures are as nearly accurate as it is possible to obtain and are secured as a result of daily reports received by the Commission from all inspectors which, amongst other statistics contain the number of installations re-wired and the approximate cost or money expended in doing so, so that it may be considered as a very fair estimate of the expenditure involved.

The system of factory inspection which was instituted during the fiscal year of 1916 is still being continued and meeting with much success. As explained in a previous report this system permits institutions employing their own electrical



help to make such changes or alterations in their wiring plant as the exigencies of their business demand, without the necessity of obtaining a special permit for each and every alteration or what may in some cases be very trivial changes. By paying an annual inspection fee they are entitled to a monthly inspection and a report which is used with good effect in checking up the work of their employees. By way of explanation it might be well to mention that while trivial alterations and changes are generally considered by the average person to be of little or no particular importance or to carry with them any danger, such an idea is very erroneous. The most trivial alterations to a wiring installation, if improperly executed, may introduce very serious danger, notwithstanding the fact that the entire balance of the installation may be in perfectly safe condition.

The handy man, who was previously so much in evidence around large establishments, was, under the old dispensation, privileged and perfectly free to mutilate or doctor up the best installations that money could procure. It has been the inspectors' experience to pass many first-class installations when new and return shortly afterwards to find that the handy man had added to or altered them in such a way as to render them unsightly and in some cases decidedly dangerous. It is owing to the strict enforcement of the present permit system that the most of this dangerous practice is being fast eliminated.

In explanation of the foregoing a case might be cited where a temporary light or possibly a small motor was required in proximity to some electrical circuit which was in the immediate vicinity and the work was consigned to the handy man or the person who sometimes assumes the name of the firm's electrician, to hitch up the motor or lights as the case may be, and while the work may have been carried out fairly satisfactory in most respects, one joint between the wire thus added and the existing supply wires was left loose and unsoldered. This may have been owing to the fact that the man did not have a soldering torch handy, and intended, as is the invariable excuse, to fix it up some time later on. The work involved in soldering a joint or the addition may have been most trivial, but the danger involved in the loose joint might become colossal. A loose joint can produce intense heat, even causing the wire to melt off at this point or set fire to the insulation, and if there is any inflammable material in the immediate vicinity the results are often disastrous—hence the necessity for vigilance and care in the enforcement of the Commission's regulations.

One of the most prolific causes of fires and accidents is chargeable to the over-fusing of circuits, and while the old electrical code correctly specified and listed the fusing of circuits there was no way of enforcing it except by an increase in insurance rates when it was discovered. The Commission, however, has adopted a regulation making the over-fusing of circuits a punishable offence, and convictions have been already secured for violation of this rule. Electric fuses, when properly installed, are constructed in such a manner that no sparks or fire will be emitted when they operate, and under the Commission's regulations they are enclosed in steel cabinets if they are in any way exposed to inflammable material and personal contact. Before this regulation was adopted the over-fusing of circuits was carried on in a most alarming and indiscriminate manner. In the office of the Inspection Department of the Commission are to be found samples of materials which have been used to defeat the object of the fuse, which are little short of criminal. The evil, however, is disappearing owing to the enforcing of the regulation of the Commission, which reads as follows: "Fuse holders must not be filled with other than approved fuses of the proper carrying capacity or must not be bridged with wire or other objectionable material."



AS-71-08



MAP  
OF  
**ONTARIO**  
DISTRICTS OF ELECTRICAL INSP. DEPT.  
H.E.P.C.



In order to illustrate the alarming manner in which this pernicious practice was carried out, a case is recorded and a sample of the fuse is to be seen in the office of the Inspection Department, where a steel bar  $\frac{5}{8}$ -in. in diameter was inserted in a fuse holder. The fuse holder in question was designed to protect an installation the maximum current capacity of which was 60 amperes; in other words, the wire which this fuse was intended to protect was only capable of carrying for an indefinite period a current of 60 amperes. Through the blowing of this fuse owing to some defect or trouble in connection with the installation, the handy man substituted the piece of steel bar which, it is estimated, would carry before melting a current of approximately 1,550 amperes. When it is realized that this overloads the circuit by over 1,000% it is easy to conceive what a serious condition of affairs existed, and not only the necessity for the adoption of the rule but justifications for its strict enforcement and the penalizing of every offender proven to be guilty of such misdemeanor. In the case referred to, considerable damage was done to the installation, resulting in the burning out of the transformers, and might have not only done material damage but become a source of serious danger to life.

Before electrical inspection was instituted by the Commission a very inferior class of wire was being used, resulting in much damage and many fires—records, samples and illustrations of which are in the possession of the Commission's Inspection Department. A rule was adopted, however, requiring a much superior class of wire, and in justification of this regulation Figure 1 is referred to. This illustration shows a piece of steel conduit taken from an installation. A large hole is seen burned through this pipe owing to the inferior insulation on the wire breaking down and permitting the wire to come in contact with the metal of the pipe, with the result shown. In this particular case it happened on the outside wall of a building and did not result in any fire loss.

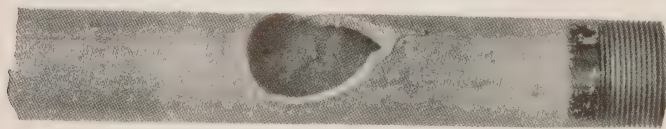


Figure 1.

Since the Commission's Inspection Department has been engaged in requiring the improving of old wiring there has been a number of such cases unearthed and remedies brought about; in fact, there are on record cases where entire residences have been wired in the defective manner described, and inasmuch as there was no system of inspection, permits or notice to the Commission, irresponsible wiremen were privileged to perpetrate this fraud on innocent householders and owners of buildings, collect for their defective work and get away with it unpunished. Contractors of this class are now rapidly disappearing, and by carefully investigating complaints which have been sent in, it is generally found that it is this class of wireman and irresponsible handy man who is the first to find fault with the Commission's regulations or the inspectors appointed to enforce their orders.

Under the old regulations it was permissible and is yet in many other places possible to run wires in what is known to the trade as wood moulding or casing. The abolishing of wood moulding construction in Ontario was approved by the

trade generally, it being conceded as a step in advance in electrical construction work, and while there are some districts in the United States where moulding is not permitted, probably Ontario is the only Province where this method has been prohibitive. The chief disadvantage of wood moulding is a tendency to conceal defective work with consequent danger. In order to properly inspect wires in wood moulding it was, of course, necessary to remove the capping.

Another serious objection to construction of this kind was the tendency to drive nails or fasten metallic objects to the wood moulding. The Commission's inspectors have discovered in places such as hardware stores, where rows of nails have been driven through a length of wood moulding for the purpose of hanging metal pots or other goods for display. Wood moulding was also frequently installed on metal ceilings and walls. This practice resulted in the wires becoming grounded or in electrical contact with the wall or ceiling, as the case might be, owing to such driving of nails or screws through to the metal. It is also susceptible to moisture, and once water finds its way into the grooves it lodges there for a long time, becoming a source of danger. No one knows or ever will know the actual fire loss which may have arisen from this doubtful method of construction. It is, however, generally conceded that the possibilities of fire from this cause are very great, and the entire elimination of this class of work is found to impose no hardship on anyone, nor has there been the slightest objection from any quarter or any desire on the part of anyone in this Province to return to this method.

Before concluding reference to the rules it might be in order to refer to the regulation requiring not less than a  $\frac{3}{4}$ -inch conduit for services in any building. Opinion was somewhat divided on the adoption of this regulation, but after due and careful consideration it was felt that the adoption of the rule was necessary. Heretofore it was permissible to install a half-inch conduit containing two conductors of not less than No. 12 B. & S. gauge. This is the largest size of wire that a pipe of this kind will properly contain. Practice has shown that during the past year, owing to the abnormal demand for electric heaters and ranges, in fact all class of appliances that the occupants and owners of houses were called upon to either provide a larger service pipe or on the other hand were tempted to add such devices to their wiring and greatly overload their present service, and in many cases additions of this kind have been made without notice to the Inspection Department. This is a very dangerous practice and is thoroughly realized by all supply authorities, often resulting in the burning out of meters with consequent danger to the installation. Wilful violations, however, on the part of those who thoroughly understand the regulations, have been punished in police court.

After mature deliberation, however, the adoption of this rule was considered a step in the right direction, and inasmuch as it is not a retroactive rule the difference in the initial cost on a new house, between a  $\frac{1}{2}$ -inch and a  $\frac{3}{4}$ -inch, which is now the minimum, is very trifling, varying from ten cents upwards, according to the length of the pipe.

There is only one other change of importance, and that was made during the past year, viz., the introduction of 660-watt sockets. The tremendous sale of household utensils such as toasters, irons, heaters, etc., has brought with it more or less danger, owing to the manner in which the use of these devices are advertised, as previously referred to in this report, and in order to cope with the situation it was considered advisable to make the 660-watt socket the standard in this Province in place of the 250-watt which is now standard throughout the rest of this continent.



The question of adopting 660-watt sockets is being seriously considered by most of the States in the Union, but owing to war conditions and the large stocks which are carried by the American warehouses and factories, it was considered advisable to hold the matter in abeyance for the present.

In Ontario, however, it was not found so difficult to adopt this regulation owing to the limited number of manufacturers here and the small stocks carried, but at the time of compiling this report old stocks are being quickly used up or sent out of the Province altogether. Once the 660-watt socket is entirely adopted in proportion to the number of old sockets replaced thereby, the hazard in connection with heaters and other devices will be reduced and every reasonable endeavor will be exercised to effect this end.

During the fiscal year ending the 31st October, 1918, there have been recorded 110,445 inspections on various classes of new electrical installations inside buildings. This, of course, does not comprise the innumerable inspections of which no records have been kept, such as old wiring or visits which have been paid to large buildings or manufacturing concerns for the purpose of advising or assisting in laying out work which, if computed, would probably be at least half as much more as recorded.

Also during the past year the sum of \$223,900.61 has been expended by the owners or occupants of buildings in replacing old or defective wiring.

There have been nineteen convictions in police courts for deliberate and wilful violations of the rules during the past year, and in no case has anyone been summoned to court unless the case was thoroughly investigated and it was shown beyond peradventure that the offending parties were thoroughly familiar with the rules and by nature of their business could reasonably be expected to know the law.

In a great many cases violations of the rules and regulations have been unearthed by the inspectors, and where there was reasonable doubt that they were not aware of the rules or the actual guilty parties could not be located, suitable warnings have been issued. In a word, every consideration has been given and every endeavour has been put forth with a view to obtaining a safe class of work rather than adopt any arbitrary methods.

## RURAL POWER

The Commission built 20.1 miles of pole line carrying 4,000-volt circuit to serve the townships of Whitby, East Whitby and Pickering, and the Village of Brooklin, and also constructed a distribution system in Brooklin.

## Waterloo Township Syndicate No. 1

WORK DONE BY 20-H.P. MOTOR, JANUARY 1, 1918 TO JANUARY 1, 1919

## No. 1 Farm

Silo filling .....	12' x 42' silo filled, settled and refilled.
Threshing .....	400 bushels wheat.
	900 " oats.
	1,800 " mixed grain.
	300 " barley.
	100 " peas.
Chopping .....	1,800 "
Sawing wood .....	25 cords.

## No. 2 Farm

Silo filling .....	14' x 39' silo filled, settled and refilled twice.
Threshing .....	600 bushels wheat.
	1,800 " mixed grain.
	800 " barley.
	800 " oats.
	30 " beans.
Chopping .....	2,500 "
Sawing wood .....	16 cords.

## No. 3 Farm

Silo filling .....	12' x 40' silo, filled 35'.
Threshing .....	320 bushels wheat.
	1,500 " oats.
	2,600 " mixed grain.
	800 " barley.
	140 " buckwheat.
Chopping .....	2,500 "
Sawing wood .....	10 cords.

## No. 4 Farm

Silo filling .....	8' x 22' and 9' x 22' silos filled, settled and refilled.
Threshing .....	330 bushels wheat.
	1,200 " oats.
	400 " mixed grain.
	70 " buckwheat.
Chopping .....	1,500 "
Sawing wood .....	15 cords.

## No. 5 Farm

Silo filling .....	11' x 30' silo filled.
Threshing .....	100 bushels buckwheat.
	1,200 " mixed grain.
	900 " oats.
Chopping .....	1,400 "
Sawing wood .....	20 cords.

## No. 6 Farm

Silo filling .....	14' x 40' silo filled.
Threshing .....	400 bushels wheat.
	3,500 " mixed grain.
Sawing wood .....	10 cords.

## No. 7 Farm

Silo filling .....	11' x 44' silo filled.
Threshing .....	100 bushels wheat.
	2,000 " mixed grain.

## Waterloo Township Syndicate No. 2

WORK DONE BY 20-H.P. MOTOR, FROM JANUARY 1, 1918 TO JANUARY 1, 1919

## No. 1 Farm

Silo filling .....	12' x 40' and 12' x 40' silos filled.
Threshing .....	200 bushels wheat. 800 " barley. 300 " mixed grain. 1,500 " oats.
Sawing wood .....	5 cords.

## No. 2 Farm

Silo filling .....	12' x 30' silo filled, settled and refilled.
Threshing .....	1,200 bushels oats. 1,200 " mixed grain.
Cutting straw .....	2 days.
Sawing wood .....	7 cords.

## No. 3 Farm

Silo filling .....	12' x 42' silo filled, settled and refilled.
Threshing .....	100 bushels wheat. 1,500 " oats. 600 " barley.
Sawing wood .....	12 cords.

## No. 4 Farm

Silo filling .....	9' x 10' x 23' and 8' x 9' x 23' silos, filled, settled and refilled.
Threshing .....	1,500 bushels oats. 500 " barley.
Sawing wood .....	8 cords.

## No. 5 Farm

Silo filling .....	9' x 24' and 10' x 14' x 20' silos filled, settled and refilled.
Threshing .....	160 bushels wheat. 1,500 " oats. 600 " barley. 400 " mixed grain.

## No. 6 Farm

Silo filling .....	12' x 33' silo filled.
Threshing .....	175 bushels wheat. 1,000 " oats. 325 " barley. 1,000 " mixed grain.
Chopping .....	2,300 "
Sawing wood .....	10 cords.

## Waterloo Township Syndicate No. 3

WORK DONE BY 20-H.P. MOTOR, FROM JANUARY 1, 1918 TO JANUARY 1, 1919

## No. 1 Farm

Silo filling .....	12' x 30' silo filled, settled and refilled.
Threshing .....	150 bushels wheat
	1,018 " oats.
	310 " barley.
	735 " mixed grain.
Chopping .....	12 hours, bushels not specified.

## No. 2 Farm

Silo filling .....	12' x 36' silo filled.
Threshing .....	1,450 bushels oats.
	1,000 " barley.
Chopping .....	300 "

## No. 3 Farm

Silo filling .....	11' x 25' silo filled.
	8' x 25' silo filled 12'.
Threshing .....	1,300 bushels mixed grain.
Chopping .....	900 "
Sawing wood .....	4 cords.

## No. 4 Farm

Silo filling .....	10' x 16' x 30' silo filled, settled and refilled.
Threshing .....	15 bushels wheat.
	1,200 " oats.
	600 " barley.
	1,300 " mixed grain.
	40 " rye.
Chopping .....	2,500 "
Sawing wood .....	13 cords.

## No. 5 Farm

Silo filling .....	12' x 28' silo filled.
Threshing .....	130 bushels wheat.
	1,000 " oats.
	700 " mixed grain.
	200 " barley.
	60 " peas.

## No. 6 Farm

Silo filling .....	9' x 24' silo filled, settled and refilled.
Threshing .....	75 bushels wheat.
	1,200 " oats.
	700 " mixed grain.
Chopping .....	1,500 "
Sawing wood .....	13 cords.





Waterloo Township Syndicate No. 2

Uses of Power for Lighting, Small Power and Large Power Purposes from January 1, 1918 to January 1, 1919  
Rate—Service Charge \$30.00 per year; Power 5c. per K.W.H. Discount 10% from Power only

POWER USED BY LIGHTING AND APPLIANCES  
Kilowatt Hours

POWER USED BY LIGHTING AND APPLIANCES Kilowatt Hours														Cost per Year				
Farm No.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Domestic	Small Power	20 H.P. Motor	Service Charge	Total
1	52	46	41	37	28	21	23	23	29	32	46	57	435	\$19.57	\$13.50	\$32.80	\$30.00	\$95.87
2	59	45	39	38	25	16	15	17	25	24	41	67	411	18.50	9.27	21.96	30.00	79.73
3	39	36	30	20	13	15	13	7	15	17	25	36	266	11.97	16.20	26.77	30.00	84.94
4	35	31	27	22	16	11	9	9	17	16	42	44	279	12.55	18.45	26.82	30.00	87.82
5	25	39	18	23	21	15	3	4	12	22	24	25	231	10.39	9.90	12.51	30.00	62.80
6	61	52	52	49	38	33	28	29	37	38	46	57	520	23.40	.....	33.30	30.00	86.70
Total	271	249	207	189	141	111	91	89	135	149	224	286	2,142	\$96.38	\$67.32	\$154.16	\$180.00	\$497.86

POWER USED BY 5 H.P. MOTOR

Kilowatt Hours

Farm No.	Kilowatt Hours												Cost per Year					
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Domestic	Small Power	20 H.P. Motor	Service Charge	Total
1	.....	20	50	50	30	30	20	20	10	10	30	30	300	.....	\$13.50	.....	.....	.....
2	.....	.....	10	6	20	20	30	20	30	20	10	40	236	.....	9.27	.....	.....	.....
3	40	40	40	30	30	40	10	10	30	30	20	40	360	.....	16.20	.....	.....	.....
4	30	30	30	50	40	50	20	30	30	30	40	30	410	.....	18.45	.....	.....	.....
5	10	20	20	30	20	20	.....	10	20	30	20	20	220	.....	9.90	.....	.....	.....
6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	80	110	150	166	140	160	80	90	120	120	120	160	1,496	.....	\$67.32	.....	.....	.....

POWER USED BY 20 H.P. SYNDICATE OUTFIT DOING WORK AS PER ACCOMPANYING TABLE

Kilowatt Hours

Farm No.	Kilowatt Hours												Cost per Year					
	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Domestic	Small Power	20 H.P. Motor	Service Charge	Total
1	294	41	.....	.....	.....	.....	11	.....	138	.....	245	.....	729	.....	.....	\$32.80	.....	.....
2	19	188	.....	61	.....	.....	.....	68	68	47	105	.....	488	.....	.....	21.96	.....	.....
3	66	145	.....	.....	.....	.....	.....	68	154	154	.....	162	595	.....	.....	26.77	.....	.....
4	210	.....	.....	.....	.....	.....	.....	66	138	138	.....	182	596	.....	.....	26.82	.....	.....
5	79	.....	.....	21	.....	.....	.....	69	.....	.....	109	.....	278	.....	.....	12.51	.....	.....
6	101	.....	189	48	49	17	56	21	84	8	127	40	740	.....	.....	33.30	.....	.....
Total	690	453	189	69	110	17	67	21	493	347	586	384	3,426	.....	.....	\$154.16	.....	.....

EQUIPMENT ON FARMS

- 1.—5 H.P. 3 phase motor, washing machine, iron toaster
- 2.—5 H.P. 3 " " " "
- 3.—5 H.P. 3 " " " "
- 4.—5 H.P. 3 phase motor, iron toaster
- 5.—5 H.P. 3 " " " "
- 6.—2-1 H.P. 1 phase motor, on lighting circuit, iron toaster.

Waertloo Township—Syndicate No 3.

Uses of Power for Lighting, Small Power and Large Power Purposes from January 1, 1818 to January 1, 1919  
Rate—Service Charge \$30.00 per year; Power 5c. per K.W.H Discount 10% from Power only

POWER USED LIGHTING AND APPLIANCES

Cost per Year

Farm No.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total	Domestic	Small Power	20 H.P. Motor	Service Charge	Total
1	42	33	34	33	28	24	25	25	27	30	36	47	384	\$17.28	.....	\$19.71	\$30.00	\$66.99
2	62	44	43	36	30	16	14	13	13	10	32	46	362	16.29	.....	20.07	30.00	66.36
3	36	26	20	17	12	12	9	12	12	15	23	31	221	9.94	.....	19.12	30.00	59.06
4	47	38	38	32	20	16	11	15	19	23	40	46	345	15.52	.....	32.22	30.00	77.74
5	96	67	48	40	35	17	10	11	23	31	43	63	484	21.78	\$7.65	19.26	30.00	78.69
6	55	60	45	45	35	30	24	25	29	39	54	60	501	22.54	.....	23.22	30.00	75.76
Total	338	268	228	203	160	115	94	99	123	148	228	293	2,297	103.35	\$7.65	\$133.60	\$180.00	\$424.60

POWER USED BY 5 H.P. MOTOR

Kilowatt Hours

1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5	10	10	20	10	20	20	10	20	10	10	20	10	170	.....	\$7.65	.....	.....	.....
6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total	10	10	20	10	20	20	10	20	10	10	20	10	170	.....	\$7.65	.....	.....	.....

POWER USED BY 20-H.P. SYNDICATE MOTOR DOING WORK AS PER ACCOMPANYING TABLE

Kilowatt Hours

1	117	63	.....	.....	.....	.....	.....	.....	34	.....	82	142	438	.....	.....	\$19.71	.....	.....
2	150	.....	.....	.....	.....	.....	.....	.....	45	.....	104	147	446	.....	.....	20.07	.....	.....
3	205	.....	65	.....	.....	.....	.....	.....	.....	94	46	11	421	.....	.....	19.12	.....	.....
4	80	294	31	23	48	44	.....	.....	37	50	78	31	716	.....	.....	32.22	.....	.....
5	130	.....	.....	.....	.....	.....	17	.....	55	44	46	136	428	.....	.....	19.26	.....	.....
6	69	96	.....	57	.....	44	5	.....	49	35	80	81	516	.....	.....	23.22	.....	.....
Total	751	453	96	80	48	88	22	.....	220	223	436	548	2,965	.....	.....	\$133.60	.....	.....

EQUIPMENT ON FARMS

No. 1.—1 H.P. single phase motor on lighting circuit, iron, toaster.  
2—  
3—1 H.P. , single phase motor on lighting circuit “ “ “ “ “ “  
No. 4.—1 H.P. single phase motor on lighting circuit, iron, toaster.  
5—5 H.P. three “ “ “ “ “ “  
6—1 H.P. single “ “ “ “ “ “

# NIAGARA FARMS

As noted in the report of 1917, the Commission created a department known as the Farms Operation Department to operate as farms, such properties as were suitable for this purpose and had been acquired in connection with the necessary right-of-way of the Chippawa power canal project.

As the Farms Operation Department did not begin operation until late in the fall of 1917, it was therefore seriously handicapped by reason of not being able to accomplish a sufficient amount of fall plowing, and as much of the land which was assigned to it for farming purposes was in a very exhausted and impoverished condition, the crops harvested for the year were not as large as can be expected for succeeding years.

On account of the shortage of labor it was decided to use tractors in the operation of these farms and as a result four small tractors were purchased and operated throughout the season.

A total of 1,195 acres were under cultivation as follows:

Wheat .....	267	acres	
Oats .....	278	"	
Barley .....	34	"	
Barley and Oats .....	23	"	
Beans.....	17	"	
Soy Beans .....	5	"	
Hay .....	372	"	
Potatoes .....	21	"	
Cucumbers .....	9	"	
Asparagus .....	8	"	
Rhubarb .....	2	"	
Fruit .....	159	"	Including gooseberries, raspberries, cherries, peaches, apples, grapes, etc.
	1,195		

The total crop harvested from the above acreage was as follows:

Wheat .....	2,544	bushels
Oats .....	5,429	"
Barley .....	180	"
Barley and Oats.....	1,028	"
Beans.....	30	"
Soy Beans .....	5	tons forage
Hay.....	227	tons
Potatoes .....	810	bushels
Cucumbers .....	20,082	lbs.
Asparagus .....	920	dozen bunches
Rhubarb .....	6	tons

## FRUIT

Gooseberries .....	255	quarts
Strawberries.....	1,635	"
Raspberries.....	2,616	"
Cherries .....	1,889	11 quart baskets
Grapes .....	30,250	lbs. and 50-6 qt. baskets
Peaches.....	1,342	11 quart baskets
Apples.....	2,500	bushels

During harvesting and the whole of the fruit season the Commission availed itself of the Ontario Government National Service arrangement to secure the necessary help to take off the grain and fruit.

In anticipation of continuing the operation of these properties during 1919, 568 acres have been fall plowed, and of this amount 129 acres have been seeded to wheat, 26 acres to rye and the balance is ready to go on with operation as soon in spring as the ground can be worked.

In addition to the grain and fruit as handled in 1918, the Commission intend to feed a considerable number of beef cattle during 1919.



## ELECTRIC RAILWAY WORK

### General

As the 1916 amendment to the Railway Act forbade active construction of the proposed Hydro-Electric railways during the continuance of the war, the staff was reduced to a minimum but the general work of the department in compiling specifications and preparing standard designs, was carried on. The freight traffic data, collected by canvass in the more important cities, towns and villages of the province, was carefully gone over and classified and is now in a convenient form so that it may be used for future estimates. Some time has been spent in arranging the details of the preliminary estimates that were prepared on the Toronto N.E., Toronto-London and other lines. When these estimates were prepared, time was not available for presenting them in as complete detail as might be desired but this work is now well in hand.

During the past year all the agreements made by the Commission and the various companies absorbed by the Commission, in regard to wire crossings, underground crossings, and matters referable to the Board of Railway Commissioners and the Ontario Railway and Municipal Board have been placed under one complete filing system. All engineering matters pertaining to agreements, leases, etc., effected with the various railway companies operating under these boards are now handled through a branch of the Railway Department.

### London & Lake Erie Railway & Transportation Co.

Acting on a request from the City of London a number of estimates were prepared showing the effect of uniting the London-Lake Erie Railway and the London & Port Stanley Railway; also estimates of the probable operating revenue and expense of operation of portions of the Lake Erie line. Several meetings were held at London during the year but it was found impossible to recommend the purchase of any portion of this line with a view to putting it in operation, as the receipts appeared to be too low to warrant such action. Negotiations having failed, it was found advisable by the owners of the line to dispose of the property as scrap, which is now being done.

### Minden District

Work in connection with estimates on a proposed line between Kinmount Junction and Minden was proceeded with and when the estimates were completed, it was found that sufficient business could not be secured to allow of a favorable report being presented. The municipalities having been so informed, a deputation called at this office in March, 1918, and it was the opinion of those present that further traffic could be located. A committee was appointed to look into the matter but they were unable to secure any further traffic than that which had already been located by our men; however, on their request, an engineer visited the district in September, 1918, and an active canvass was commenced of the shippers in the district. The data so secured are now being compiled but the outlook for a favorable report is not promising.

## MUNICIPAL WORK

### MISCELLANEOUS

#### Cobden

Assistance was given to the local officials to enable them to more efficiently operate their local plant and storage systems. Preliminary investigations were made in connection with a proposed auxiliary steam plant, but it was decided to postpone the erection of their plant for the present.

#### Haliburton

A preliminary report was made with reference to a supply of power to Haliburton village from a proposed development at the outlet of Drag Lake, one and one-half miles from the village limits. Owing to the high costs of labor and material it was decided that the present time was not opportune for this development.

#### Parry Sound

Assistance was given to the municipality in connection with the operation of the Seguin River storage system. Preparations are under way for the construction of dams and generating station in the town to supply the growing demands for power.

#### South River

A detailed valuation of real estate, power development, distribution system, etc., the property of the South River Electric Company, was made for the municipality by the Commission's engineers.

#### Sundridge

A valuation of the distribution system in the village, the property of the South River Electric Company, was made by the Commission.

## MUNICIPAL AND RURAL DISTRIBUTION

### Engineering

Engineering service was furnished by the Commission in connection with the following distribution systems:

Almonte, Bloomfield, Bobcaygeon, Bradford, Chatham, Collingwood, Dereham Tp., Drumbo, Elmwood, Embro, Etobicoke Tp., Hanover, London, Neustadt, Niagara Falls, Norwich, Ottawa, Paris, Picton, Preston, Port Perry, Scarboro Tp., Thornton, Tottenham, Uxbridge, Welland, Wellington, Wolverton.

## STREET LIGHTING

### Engineering

Engineering advice regarding the operation of street lighting systems or the purchase of equipment therefor was supplied by the Commission for the following municipalities:

Almonte, Amherstburg, Aylmer, Beeton, Blenheim, Bobcaygeon, Bradford, Brantford Tp., Campbellford, Chatham, Cobourg, Cookstown, Drayton, Dresden,

Goderich, Hensall, Ingersoll, London, Millbrook, Moorefield, North Bay, Petrolia, Port Arthur, Port Colborne, Ridgetown, Sarnia, Stamford Tp., St. Catharines, St. Thomas, Scarboro Tp., Stayner, Stratford, Tottenham, Trenton, Tweed, Walkerville, Waterdown, Winchester, Windsor.

## GENERAL ENGINEERING

Cable	Material Inspected				
	W.P. and R.C. Copper lbs. 30,985	Bare lbs. 135,520	Aluminum lbs. 495,000 new 300,000 refab.	Steel lbs. 350,000 lbs.	
Insulators	Strain	Telephone	13,200 volts	26,400 volts	44,000 volts
	7,365	99,375	6,500	15,750	8,700
					110,000 volts 25,700

## TESTING AND RESEARCH LABORATORIES

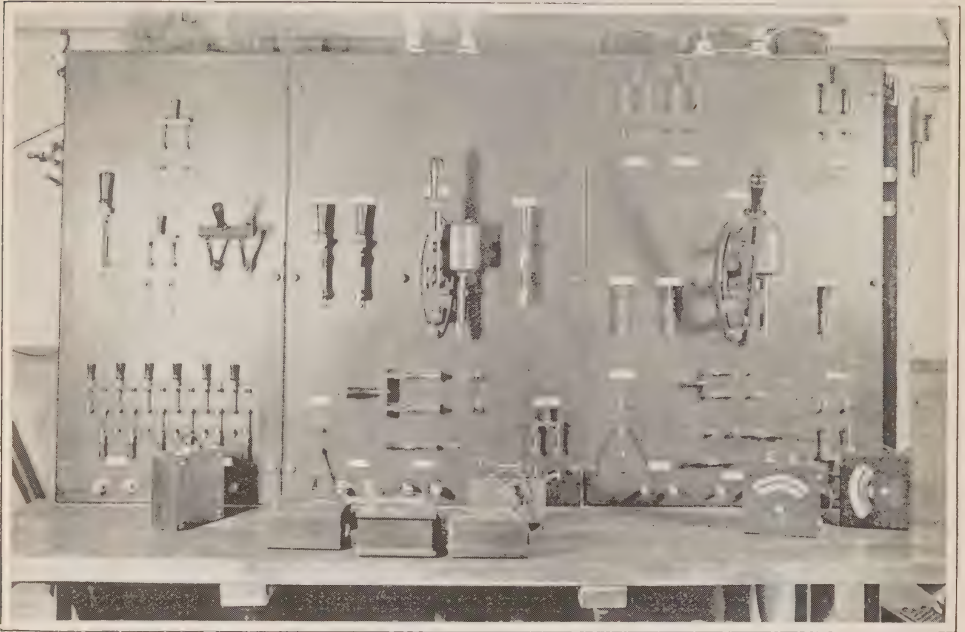
The past year has seen a notable increase in the volume of work which has passed through the laboratories. This has been due partially to the growth of the system as a whole and partially to a greater tendency on the part of all departments of the Commission to make use of the laboratories. During the year over 6,000 tests were made in all departments; these included routine tests following standardized methods, and special tests requiring considerable thought in preparation and special arrangements of apparatus. The increase in volume of testing has affected all sections of the laboratories, but special mention should be made of the increase in the number of lamp tests made for parties outside the Commission, to which further reference is made below; also to the expansion of the approval laboratory, to the growth of work of a research character, to the number of tests and investigations which the laboratories has been called upon to make in the field at various points throughout the system, and to the satisfactory progress of an investigation into the properties of materials for concrete construction, which gives every promise of effecting considerable economies in the cost of this construction.

In connection with construction work of all kinds the laboratories has done a great deal of inspection both in factories and in field and has several inspectors at present resident at various jobs.

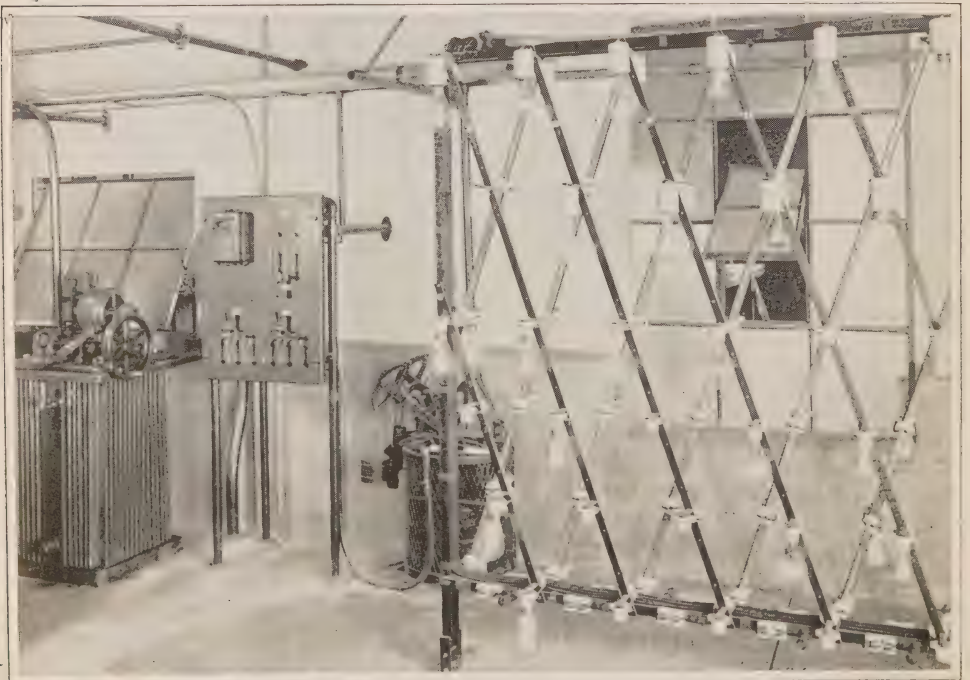
During the year most of the extensions to the equipment and space were completed and new equipment was added from time to time as required. The most important single item of new equipment is a motor-generator set for general supply of power for testing. It consists of a 100-k.v.a., 25-cycle synchronous motor driving on the same shaft a 75-k.v.a., 25-cycle alternator, a 50-k.w., direct-current generator and an exciter for the motor and alternator. The direct-current generator is equipped with Tirrill regulator control, and may be used to excite the alternator, which will supply voltages of 550, 1,100, or 2,200 by means of series of parallel arrangements of its coils. This set will thus furnish an ample supply of direct or alternating current under flexible and easily controllable conditions.

The organization of the laboratories is arranged as conveniently as possible to meet the varied demands which are made upon it. The work is carried on under the following divisions, each being in charge of an assistant laboratory engineer:





Testing board in High Tension Laboratory. High voltage panel to the right; low voltage panel in centre; direct current panel to the left. Tests on motors, transformers, etc., may be made on this board with a minimum of temporary wiring.



Part of the lamp testing equipment, showing voltage regulator and control panel, constant current transformer and a portion of the life rack.



High Tension and General Electrical Testing Laboratory, Meter and Standards Laboratory, Photometric Laboratory, Structural Materials Laboratory, Photographic Laboratory.

In addition several members of the staff devote practically their entire time to special investigation. Such work is both theoretical and experimental; the experimental work is carried on either in the various laboratories mentioned or in rooms reserved especially for research work. These members of the staff call upon the various laboratories for assistance as required. Among the subjects attacked during the past year may be mentioned—calculations relative to several proposed high tension lines, the development of a corona voltmeter for the High Tension Laboratory, several theoretical investigations of voltage drop in rotary converter leads, cable sheaths and electric furnace circuits; investigation of the properties of a vapor rectifier, and several others.

The engineers engaged in this work also assist the various laboratories in investigations which fall properly within the spheres of these laboratories.

A fuller description of the work of the various laboratories will be given below:

### High Tension and Electrical Testing Laboratory

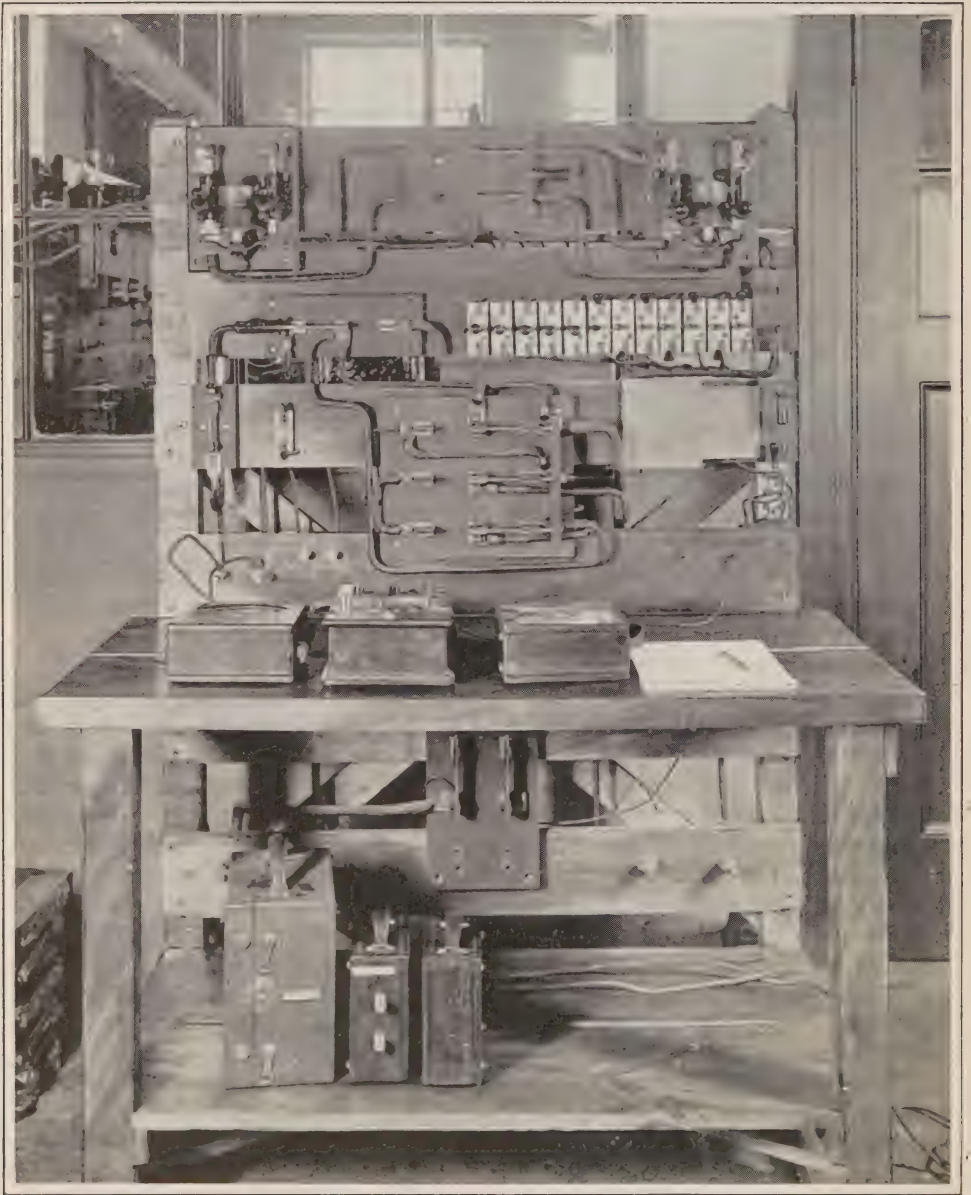
The work coming to this laboratory consists of practical engineering problems and may involve anything from a simple test to an elaborate investigation involving many tests and may be conducted in or outside of the laboratory. As far as possible the work is standardized and classed as routine. This does not mean that the subjects so treated are of secondary importance, but that uniformity of methods and conditions of tests insure results which bear a definite relation to each other and that the time and other expenses of testing are reduced to a minimum.

Routine electrical tests are made on many classes of apparatus and materials. The various commercial tests are made on constant potential and constant current transformers, alternating and direct-current generators and motors along the lines mentioned in previous reports with the added advantage of equipment especially suited for this class of work. The testing of oil for dielectric strength is a routine test important not only because all the high-tension transformers and oil-breakers are thus looked after, but approximately forty samples per month are received from various municipal stations. High-tension insulator investigation is also an important routine test, though its development and the various methods of line construction warrants its mention as a special line of investigation also. Apparatus is available from which any single phase voltage up to 200,000 volts at 25 cycles or 400,000 volts at 60 cycles may be obtained and a great deal of work is done at 110,000 volts and higher.

The monthly testing and inspection of linemen's rubber gloves has become standard practice as outlined by the Committee on Accident Prevention. These tests are made to ensure the safety of linemen and others when it is found necessary to work on live apparatus and a record is kept of the life history of each glove used for this purpose.

While the work that originally came to the laboratory was of such a character that it may be allotted to the routine class the improved facilities afforded and the increase of the staff has enabled the laboratory to undertake much more extensive investigations than have previously been considered.

Among the many special subjects undertaken during the year have been the following:



Transformer test board in High Tension Laboratory.

The measurement of dielectric losses in power transmission cables at high voltage and throughout the range of temperature of normal operation by various methods.

The various properties of iron wire as a conductor for transmission lines.

The advantages and disadvantages of various methods of electric welding. This has become a very important art, particularly in the ship-building industry.

The characteristics and limitations of new types of rectifiers, etc.

The development and perfecting of various methods of making high voltage tests over the range of electrical testing. This includes development of a satisfactory method of testing out high tension transmission lines before being put into service, the accurate measurement of high voltages, particularly the peak values,



A corner of the Chemical Laboratory showing analytical balance, viscosimeter and apparatus for making flash point and burning point tests on oil.

the control of wave form and the elimination or control of the high frequency ripples on high voltage wave forms, etc.

The practical utility of the modern methods of lightning protection.

Tests leading to and advice on the drafting of specifications for certain materials and machines. The laboratory is frequently called in consultation with or requested to make tests by other departments with a view to intelligent placing of orders. Results obtained amply justify this precaution.

As might be expected, not all the above subjects are completed, and however important, some will probably take considerable time for satisfactory solution.

Frequently tests are to be made and investigations carried out which demand the assistance of specialists in several branches. The close co-operation between the various sections of the laboratories thus places at the disposal of an investigator the required assistance and the high tension and general testing laboratory has been



ably assisted by the meter laboratory in the development of satisfactory methods of measurements, as well as by all the other laboratories where the interests are mutual.

### Approval Laboratory

As a result of the notice in January of this year to all manufacturers and agents of electrical material devices and fittings made or to be sold in Ontario, the work of examining and testing these devices with a view to approving their use in this Province has increased enormously. Whereas this work was before handled as a side line by the High Tension and General Testing staff it has become necessary to segregate it to a large extent and organize a special staff to look after it. This staff is being continually augmented as the right men can be secured and trained.

To keep pace with the increase in the staff it has been necessary to provide, as was mentioned in last year's report, special equipment and testing circuits in the rooms set apart for this work. This equipment now includes a fuse testing board whereon six fuses of any one size up to 200 amperes may be tested at one time. Current is supplied to this board from a special heavy current transformer built in the laboratories, which will deliver up to 1,500 amperes at low voltage for short periods. Another valuable piece of equipment is a mechanical endurance testing machine for making life tests of all types of sockets, snap switches, etc., loads and controls for six 10-ampere and six 30-ampere devices are provided. The standard test for these devices is 6,000 complete operations while carrying full load at rated voltage, the supply being direct current.

The factory follow-up service has been enlarged as well as the laboratory service. It is the intention to provide as soon as possible complete factory inspection of all devices using the "approved" labels of the Commission. This service is being gradually extended to include all plants using the service.

Re-examination service of devices consists only in periodic inspection of samples obtained from manufacturer's stocks or in the open market. As the list of approved devices grows this service will be also extended to cover the field thoroughly.

The laboratory inspector has also been visiting factories which have submitted samples to the laboratories for approval with the object of explaining the standards and specifications used at the laboratories and assisting the manufacturer to eliminate defects and otherwise improve the devices submitted.

### Meter and Standards Laboratory

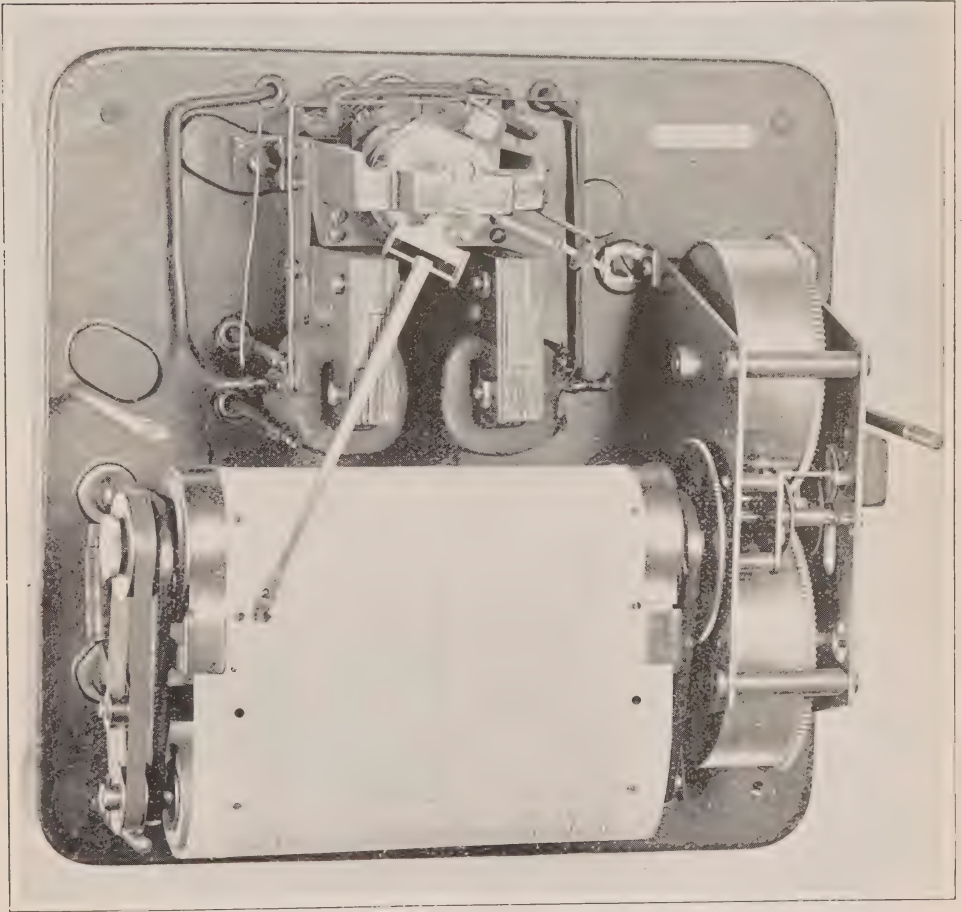
Like the other departments, the Meter and Standards Laboratory has been greatly benefitted by the increased space and facilities which have been placed at its disposal during the past year. It is now possible to divide the work, so that different classes of tests may be performed in separate rooms without interference or undue crowding. This department, now occupying about half the second floor of the laboratory building, includes the standards room, with adjoining store-room for portable instruments, a meter repair and testing shop, meter store-room and an instrument repair shop. Two separate laboratories on the same floor are at the disposal of this or other departments for any special tests which may be in progress.

The permanent table for the secondary standards is now nearing completion. It consists of a marble topped bench carrying the instruments, and fitted with apparatus for supplying current and voltage for the checking and calibrating of all ordinary portable voltmeters, ammeters and wattmeters. Work is proceeding with



similar tables for the potentiometer and the resistance bridges. With the standards, as set up, it has been possible to make many calibrations upon and to verify the accuracy of many portable instruments, belonging both to the Commission and to outside parties.

The various requirements of an organization such as the Commission, having within its scope a very wide range of engineering activities and consequent problems, often call for tests the method of which must be developed as the work proceeds. It has often been possible for this department, working in co-operation



A new type of demand meter, recently investigated in the Meter Testing Laboratory.

with the other departments of the laboratory to develop special methods of measurement which could be made at short notice, and with the equipment on hand. Among these tests may be mentioned a measurement of the leakage current of forty miles of high tension line when energized from a direct current source; a test to determine the relative ability of the thermo couple and the resistance coil to locate hot spots in generator winding; and a measurement of the power consumption of short lengths of lead covered cable under a wide variety of voltage and temperature conditions. In the last named test the problem was that of measuring quantities

of magnitude approximating 2 watts at 15,000 volts. The test was accomplished by a null method, making use of a sensitive alternating current galvanometer and obtaining the final readings on an ordinary portable wattmeter.

Oscillograph tests have been made, whenever necessary, on work where satisfactory information could not be obtained from indicating instruments. Among these may be enumerated a test on the blow-out characteristics of various types of fuses, an investigation of bus reactors under operating conditions and a detailed study of the action of a large frequency changer set. Several visits have been paid by members of the staff to manufacturers' plants, and measurements made to check up quantities of losses, etc., in large transformers and other apparatus.

In a previous report reference has been made to comparisons which were being made among different types of demand indicators. These have been continued, with actual tests on commercial loads. Several types of clock-driven and of lagged demand indicators have been compared, both as to their mechanical suitability and their electrical accuracy, as well as with due regard to their inherent operating principles. The figures shown below may be of interest as pointing to the relative reading on different types of loads, one fairly steady and the other extremely fluctuating. The maximum demands averaged over several days, as determined by the several methods shown, and, for purposes of convenience, the reading of the thermal storage meter is taken as a basis of comparison, and assigned a value of 100 per cent.

FAIRLY STEADY INDUSTRIAL LOAD.

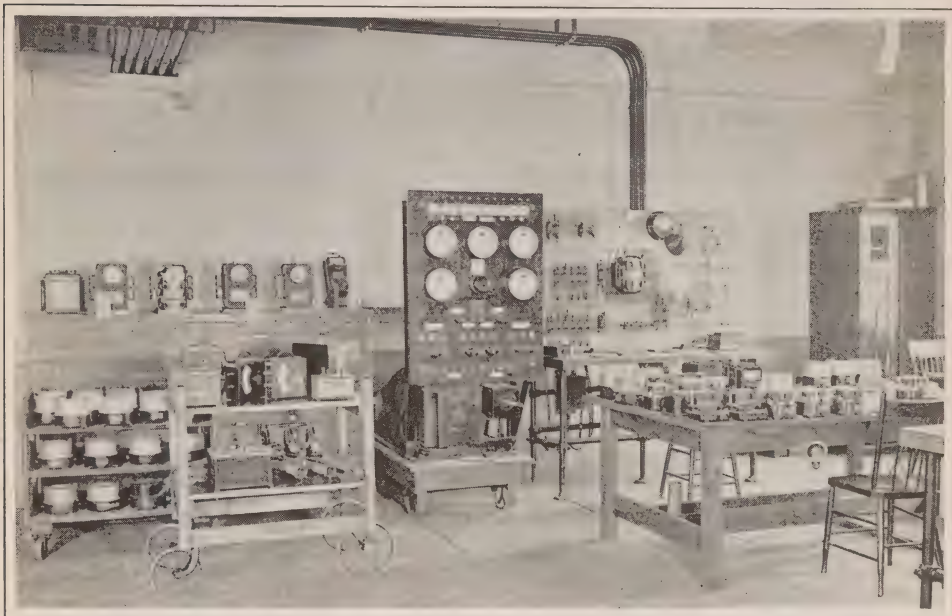
Thermal	Clock Type	Lagged ("R.O.")	Sustained
30 min.	15 min.	10 min.	10 min.
100	100.5	111.4	98.7

VERY FLUCTUATING STREET RAILWAY LOAD.

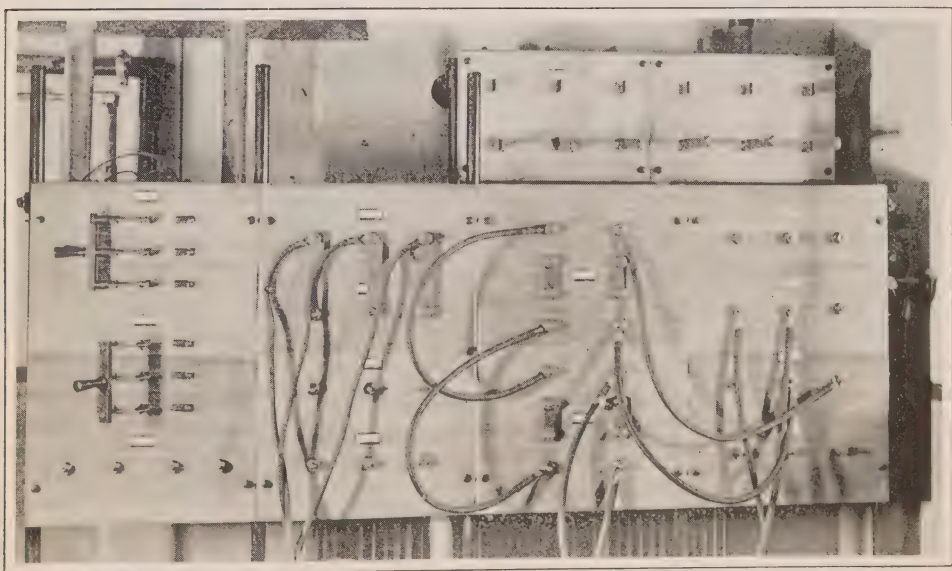
Thermal	Clock Type	Clock Type	Lagged ("R.O.")	Sustained
30 min.	15 min.	10 min.	10 min.	10 min.
100	111.5	119.7	111.5	54.6

The results of these tests show a considerable variation of the different types installed on the one load, and also a change in the relative values as the class of load is changed. To obtain a fair demand basis for billing customers it is necessary, not only to specify the time period, but also to state how the demand shall be determined.

A large number of demand indicators of various types, intended for use on customers' loads, have passed through the laboratory for examination and adjustment, before being finally sent out for installation. In addition to these, investiga-



A corner of the Meter Testing Laboratory.



Interconnecting panel in High Tension Laboratory, used to connect various sources of power to the testing boards.



tions and repairs have been made upon street lighting relays, graphic meters, meggers and other apparatus for other departments and for municipalities. It has been found possible by a slight change in design to improve greatly the operation of the street lighting relay solenoids under widely varying conditions of voltage.

The curtailment, due to war conditions, of the available power supply has, to a certain extent, reacted upon the demand for watt-hour meters; but the meter shop with improved equipment has been able to handle the work with increased efficiency. Repair and rebuilding work has been done on about 700 meters, while over 800 have passed through for Government inspection for use in the Toronto inspection district.

Attached to the Meter Department there has been opened a well equipped instrument repair shop. This facilitates the production of special work such as is continually required by a testing laboratory. Here also are facilities for keeping the electrical and other measuring apparatus in good repair and adjustment.

### Photometric Laboratory

Considerable time during the early part of the past year was taken up by the reinstallation of the photometric and life testing apparatus following the removal to larger and more suitable quarters on the top floor of the laboratory building. All the transforming and regulating equipment is concentrated in one location so as to facilitate the maintenance, adjustment and checking of the various pieces of apparatus.

For the testing of series lamps a new steel test rack has been constructed, supplied with current from a constant current transformer. This rack is so constructed that all current carrying parts are thoroughly insulated by means of covers which made accidental contact with live parts impossible but which may be instantly removed for the replacement of cut-outs or the examination of connections.

It has been found necessary to increase the capacity of the multiple lamp test racks and a steel rack was built of the same general type as the former wooden one but with a few modifications which experience has proved to be desirable.

The volume of life testing has been greatly in excess of that of former years. The routine testing of lamps received for stock, including inspection, rating and life tests, has been carried on as usual. The purpose of these tests is to detect, as far as possible, every defect or feature that tends toward unsatisfactory service. A torsion meter has recently been made use of to test the strength of the basing cement so as to reduce to a minimum the liability of the bases to become loose after lamps have been shipped out.

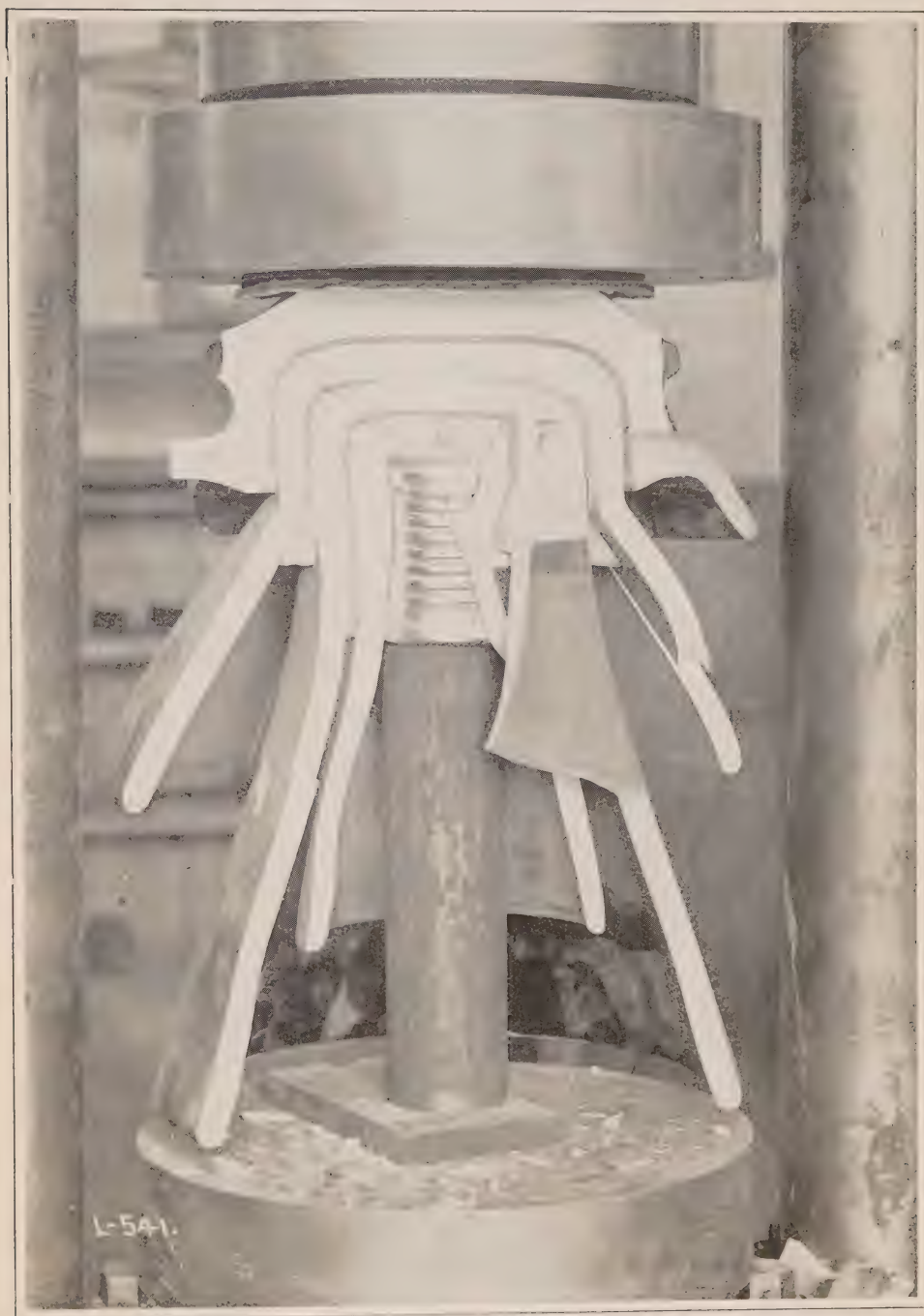
Considerable use is being made of the lamp testing facilities of the laboratory by parties outside the Commission. Approximately 50 per cent. of the multiple lamps tested are for such parties. All such tests are made under standardized methods and a definite schedule of charges for such tests is in force.

There has been a reduction in the number of tests made in the illumination department during the past year. The work has been principally confined to distribution tests on lighting fixtures and some investigations of office lighting conditions. An investigation was made of the fading effect of light on paints and varnishes for a local manufacturer.

### Photographic Laboratory

During the past year we have moved into our extended quarters, where we now have three dark rooms, one for negative work, one for enlarging, and a third





Compression test on insulator intended to hold large concrete tank—  
Structural Materials Laboratory.

room for printing. Another large room has been fitted up with a sky-light and is used as an operating room for taking indoor pictures, making copies, etc. The old room is used as a finishing room and office. Another room has been reserved for blue-printing, but the matter of installing a blue-printing machine is still in abeyance.

Some 412 orders were passed through the department and about 3,000 negatives were finished and prints made. About 1,300 negatives were made by the photographic staff and the balance sent in by different members of the Hydro staff.

Monthly trips were made to Niagara Falls, where progress pictures of both the Queenston Power Development and the Ontario Power Company extension were taken. Prints from these negatives are filed systematically and serve as records of the progress of the various construction jobs.

### Structural Materials Laboratory

The work here has trebled in volume and has been extended into a number of new lines. It is divided into four main divisions, namely, chemical testing, general mechanical testing, research and inspection.

The chemical laboratory is now well equipped for ordinary qualitative and quantitative analysis, for oil and gasoline testing and other special work. The laboratory may be said to be electrically operated, for all heating appliances such as muffle, water still, tube furnace, ovens, etc., use electricity. This has proved very satisfactory. The space at present allotted to this work has been found inadequate and a large room designed especially for this work is being fitted up and will be ready shortly.

The chemical laboratory is proving itself very valuable, and it is being used to a steadily increasing extent. During the past year there has been worked out here an economical method of frosting lamps in small quantities. Tests have been made of over 90 lubricating oils, 40 gasolines and 30 paints; this besides the usual routine analytical work.

The work of the general laboratory has increased mainly in volume. The number of cement tests handled during the year has doubled. Other testing such as concrete and aggregate tests have greatly increased. This is true of all departments of the work. Interesting tests of a special nature have been carried out, among these being tests on expansion joint fillers for concrete bridges, tests on the mechanical properties of bakelite, and tests of the strength of linemen's belts.

During the year satisfactory progress has been made upon an investigation on the "surface area" method of proportioning as applied to concrete. The preliminary studies incident to such an investigation have been completed, a definite programme of tests laid out and work commenced on this. This work involves the making of some 4,000 test specimens of mortar and concrete, besides a number of allied investigations of problems in materials which have arisen in conjunction with this work. A special staff is engaged exclusively on this.

Part of the inspection work of the Commission is now handled as the work of this department. Resident inspectors are stationed at each mill from which cement for our work is being shipped. Inspectors are also stationed at the shops fabricating the penstocks and other steel work for the Ontario Power Company extension and at Niagara Falls where these are being erected. Besides this the department has carried out much miscellaneous inspection, the work being carried out by men sent from the laboratories.

## GENERAL CONSTRUCTION

### Administration Building

Houses at 51, 53 and 59 Murray street were remodelled throughout for use as offices by the Commission. A hot water heating system was installed to supplement the existing hot air system. Electric lighting with base-board receptacles was installed.

### Niagara Garage

The Niagara Falls curling rink at the corner of Roberts street and White avenue has been leased and extensive improvements have been made to the building which is to house the Commission's trucks and cars used on the Queenston Development and around Niagara Falls. The building has been remodelled so as to include a storage room, wash floor, machine shop and general office and chauffeur's room, all heated from a hot air furnace; the heat being distributed by a fan and air duct system.

### Toronto Service Building

During the year a watchman's patrol system has been installed. Fire extinguishing apparatus has been provided and arrangements have been made for the erection of two stand-pipes connected to hose on each floor of the building.

Table No. 1  
CAPACITIES OF TRANSFORMERS INSTALLED OR ORDERED FOR COMMISSION'S STATIONS\*  
Total Capacity, \$21,585 Kv-a.

Station	Voltage	Transformers Installed		Transformers on Order		Total Station Capacity Kv-a.	System Capacity Kv-a.
		Mfr.	Kv-a.	Mfr.	Kv-a.		
(1) Niagara System .....	25-Cycles						
Niagara Transformer Station....	12,000—110,000	C.W.Co.	134,000	C.W.Co.	22,500	202,000	
	12,000—46,000	C.G.E.Co.	35,000				
	12,000—46,000	C.W.Co.	10,500				
	12,000—550	C.W.Co.	225				225
(2) Dundas Transformer Station.....	110,000—13,200	C.G.E.Co.	21,250			21,250	
Caledonia Dist. Station .....	13,200—2,300	P.T.Co.	450			450	
Watdown " " .....	13,200—2,300	C.C.W.Co.	225			225	
Hagersville " " .....	13,200—4,000	C.W.Co.	225			225	
Lynden " " .....	13,200—4,000	C.W.Co.	225			225	
(3) Toronto Transformer Station .....	110,000—13,200	C.G.E.Co.	75,000			90,000	
(4) London Transformer Station.....	110,000—13,200	C.G.E.Co.	8,750	C.G.E.Co.	15,000	8,750	
Dorchester Dist. Station.....	13,200—4,000	C.W.Co.	225			225	
Lucan " " .....	13,200—4,000	C.G.E.Co.	225			225	
Delaware " " .....	13,200—4,000	P.E.Co.	75			75	
Exeter " " .....	13,200—4,000	C.G.E.Co.	300			300	
(5) Guelph Transformer Station.....	110,000—13,200	C.W.Co.	3,000				
	110,000—13,200	C.G.E.Co.	5,000			8,000	
	13,200—2,300	C.W.Co.	225			225	
Acton Dist. Station.....	13,200—4,000	C.G.E.Co.	450			450	
Georgetown Dist. Station.....	13,200—2,300	C.G.E.Co.	75			75	
Rockwood " " .....	13,200—575	C.G.E.Co.	225			225	
Cheltenham " " .....	13,200—2,300	C.G.E.Co.	225			225	
Fergus " " .....	13,200—4,000	C.W.Co.	225			225	
Elora " " .....	110,000—6,600	C.G.E.Co.	5,250			5,250	
(6) Preston Transformer Station.....	6,600—4,000	C.G.E.Co.	60			60	
South Waterloo Twp. Distributing Station .....	110,000—13,200	C.G.E.Co.	6,750			6,750	
(7) Kitchener Transforming Station....	13,200—2,200	P.E.Co.	225			225	
New Hamburg Dist. Station.....	13,200—4,000	C.C.W.Co.	450			450	
Baden " " .....	13,200—4,000	C.W.Co.	225			225	
Elmira " " .....	13,200—4,000	M.E.Co.	75			75	
St. Jacobs " " .....							





Table No. 1—Continued  
CAPACITIES OF TRANSFORMERS INSTALLED OR ORDERED FOR COMMISSION'S STATIONS\*—Continued  
Total Capacity, 521,585 Kv-a.

Station	Voltage	Transformers Installed		Transformers on Order		Total Station Capacity Kv-a.	System capacity Kv-a
		Mfr.	Kv-a.	Mfr.	Kv-a.		
St. George " "	220—	C. C. W. Co.	150	.....	.....	150	
Burford " "	26, 400—	C. W. Co.	225	.....	75†	300	
(14) Kent Transformer Station	110, 000—	C. W. Co.	5, 000	.....	.....	5, 000	
Wallaceburg Dist. Station	26, 400—	C. G. E. Co.	450	.....	.....	.....	
Tilbury " "	26, 400—	P. E. Co.	450	.....	.....	900	
Dresden " "	26, 400—	C. G. E. Co.	300	.....	.....	300	
Bothwell " "	26, 400—	C. W. Co.	225	.....	.....	225	
Thamesville " "	26, 400—	C. W. Co.	225	.....	.....	225	
Ridgetown " "	26, 400—	C. W. Co.	225	.....	.....	225	
Blenheim " "	26, 400—	C. W. Co.	225	.....	.....	225	
Forest " "	26, 400—	C. C. W. Co.	225	.....	.....	225	
Oil Springs " "	26, 400—	M. E. Co.	75	.....	.....	75	
Watford " "	26, 400—	M. E. Co.	50	.....	.....	50	
Brigden " "	26, 400—	M. E. Co.	50	.....	.....	50	
(15) Essex Transformer Station	110, 000—	C. W. Co.	10, 000	.....	.....	10, 000	
Can. Salt Co. Dist. Station	26, 400—	C. W. Co.	2, 250	.....	2, 250	4, 500	
Leamington " "	26, 400—	.....	.....	.....	.....	225	
Essex " "	26, 400—	.....	.....	.....	.....	75	
Harrow " "	26, 400—	.....	.....	.....	.....	75	
Amherstburg " "	26, 400—	.....	.....	.....	.....	300	
Cottam " "	26, 400—	.....	.....	.....	.....	25	
Canard River " "	26, 400—	.....	.....	.....	.....	25	
Kingsville " "	26, 400—	.....	.....	.....	225†	225	
QUEENSTON DEVELOPMENT.							
(Construction Stations)	25 cycles	.....	.....	.....	.....	.....	407, 540
Montrose Sub-station	12, 000—	.....	.....	.....	3, 000	.....	
Whirlpool " "	4, 000—	.....	.....	.....	600	.....	
	12, 000—	.....	.....	.....	1, 100	4, 700	
	12, 000—	C. G. E. Co.	4, 500	.....	.....	.....	
	4, 000—	M. E. Co.	1, 200	.....	.....	.....	
	12, 000—	C. G. E. Co.	2, 210	.....	.....	7, 910	
† Transformers to be transferred to other stations.							

EUGENIA SYSTEM.				
Eugenia Gen. Station	60-Cycles 4,000—22,000	C.W.Co.	2,700	5,400
Owen Sound Dist. Station	22,000—4,000	C.W.Co.	1,650	1,650
Chatsworth	22,000—2,300	C.G.E.Co.	75	75
Chesley	22,000—4,000	C.G.E.Co.	300	300
Durham	22,000—4,000	C.G.E.Co.	150	150
Durham Cement Dist. Station	22,000—2,300	C.G.E.Co.	750	750
Mount Forest	22,000—4,000	C.G.E.Co.	300	300
Hanover	22,000—4,000	C.W.Co.	375	375
Shelburne	22,000—4,000	M.E.Co.	150	150
Grand Valley Dist. Station	22,000—4,000	C.G.E.Co.	225	225
Orangeville	22,000—4,000	M.E.Co.	450	450
Kilsyth	22,000—4,000	M.E.Co.	75	75
Elmwood	22,000—4,000	M.E.Co.	50	50
9,950				
SEVERN SYSTEM.				
Big Chute Gen. Station	60 Cycles 2,700—22,000	C.W.Co.	3,600	4,200
Penetanguishene Dist. Station	22,000—2,200	C.C.W.Co.	600	600
Barrie	22,000—2,300	C.G.E.Co.	700	700
Collingwood Dist. Station	22,000—2,300	C.G.E.Co.	1,200	2,400
Coldwater	22,000—2,300	M.E.Co.	75	75
Elmvale	22,000—2,300	C.W.Co.	225	225
Stayner	22,000—4,000	C.W.Co.	300	300
Port McNicoll Dist. Station	22,000—2,300	C.G.E.Co.	50	50
C.P.R., Ft. McNicoll Dist. Station	22,000—575	C.G.E.Co.	1,500	1,500
Waubaushene Dist. Station	22,000—2,300	C.G.E.Co.	50	50
Midland	22,000—4,000	M.E.Co.	900	900
Alliston	22,000—4,000	C.W.Co.	120	120
Beeton	22,000—4,000	M.E.Co.	75	75
Thornton	22,000—4,000	M.E.Co.	25	25
Tottenham	22,000—4,000	M.E.Co.	75	75
Cookstown	22,000—575	C.G.E.Co.	75	75
Bradford	2,300—575	M.E.Co.	300	345
		C.G.E.Co.	45	
11,715				
WASDELL'S FALLS SYSTEM.				
Wadell's Falls Gen. Station	60-Cycles 2,300—22,000	C.W.Co.	1,050	1,050
Beaverton Dist. Station	22,000—4,000	C.W.Co.	300	300
Cannington	22,000—4,000	C.W.Co.	300	300
1,650				
ST. LAWRENCE SYSTEM.				
Prescott Dist. Station	60-Cycles 26,400—2,300	C.G.E.Co.	450	450
Winchester Dist. Station	26,400—2,300	C.G.E.Co.	150	150

Table No. 1.—Continued.  
CAPACITIES OF TRANSFORMERS INSTALLED OR ORDERED FOR COMMISSION'S STATIONS.\*—Continued

Total Capacity 521,585 Kv-a

Station	Voltage	Transformers installed		Transformers on Order		Total Station capacity KV-a.	System capacity KV-a.
		Mfr.	KV-a	Mfr.	KVa.		
Brockville	26,400—2,300	C. G. E. Co.	1,500	.....	.....	1,500	7,100
Cornwall	110,000—26,400		.....	5,000			
PORT ARTHUR SYSTEM.							
Port Arthur Dist. Station	60-Cycles 22,000—2,200	S. Co. of C.	5,250	.....	.....	5,250	5,250
SOUTH FALLS SYSTEM.							
South Falls Gen. Station	6,600—22,000	C. G. E. Co.	1,200	.....	.....	1,200	2,100
Huntsville Dist. Station	22,000—2,300	C. G. E. Co.	900	.....	.....	900	
CENTRAL ONTARIO SYSTEM.							
Generating Stations—							
Fenelon Falls	{	C. G. E. Co.	810	C. G. E. Co.	750	1,560	30,660
Auburn		C. G. E. Co.	3,750			.....	
Healey Falls	6,600—44,000	C. G. E. Co.	600	.....	.....	11,250	4,500
Stephens Dam	2,400—44,000	C. W. Co.	11,250	.....	.....	4,500	
Sidney No. 2	6,600—44,000	C. W. Co.	4,500	.....	.....	9,000	2,250
Sub-Stations—							
Northumberland Pulp Mill	44,000—2,400	C. W. Co.	2,250	.....	.....	2,250	750
Delora	44,000—600	C. W. Co.	750	.....	.....	750	
Madoc	44,000—4,160	C. C. W. Co.	480	.....	.....	780	1,230
Sulphide	44,000—4,160	C. G. E. Co.	300	.....	.....	1,230	
Stirling	44,000—2,400	C. C. W. Co.	480	.....	.....	1,230	3,000
Lehigh Cement	44,000—600	C. G. E. Co.	750	.....	.....	3,000	
Point Anne Quarries	44,000—600	C. G. E.	100	.....	.....	600	3,000
Belleville Portland Cement	44,000—600	C. G. E.	600	.....	.....	3,000	
Belleville	44,000—2,400	C. G. E.	3,000	.....	.....	2,250	300
Brighton	44,000—2,400	C. G. E.	2,250	.....	.....	300	



Colborne .....	44,000—	2,400	C.G.E.	100	.....	100
Newcastle .....	44,000—	2,400	C.G.E.	100	.....	100
Bowmanville .....	44,000—	2,400	C.G.E.	1,500	.....	1,500
Oshawa .....	44,000—	4,160	C.G.E.	2,250	.....	2,250
Port Hope .....	44,000—	2,400	C.G.E.	1,050	.....	1,050
Napanee .....	44,000—	2,400	C.G.E.	600	.....	600
Wellington .....	44,000—	4,160	.....	.....	C.G.E. Co. 300	300
Cobourg .....	44,000—	2,400	C.G.E.	600	.....	600
Pictou .....	44,000—	2,400	.....	.....	C.G.E. Co. 300	300
Deseronto .....	44,000—	2,400	C.G.E.	600	.....	600
Kingston .....	44,000—	2,400	.....	1,250	.....	2,250
Millbrook .....	44,000—	2,400	C.G.E.	100	.....	100
Trenton .....	6,600—	4,160	C.G.E.	750	.....	1,350
.....	6,600—	2,400	C.G.E.	600	.....	.....
.....	44,000—	2,400	C.G.E.	1,500	.....	2,250
Lindsay .....	11,000—	2,400	C.G.E.	750	.....	.....
.....	6,600—	2,400	C.G.E.	2,250	.....	3,000
Peterboro .....	6,600—	2,400	C.G.E.	750	.....	750
.....	44,000—	2,400	C.G.E.	750	.....	300
System Spare .....	44,000—	2,400	C.G.E.	300	.....	31,660
.....	60 Cycles	.....	.....	.....	.....	.....
RIDEAU SYSTEM.	25,400—	2,400	C.G.E. Co.	750	.....	750
Smith's Falls Dist. Station .....	25,400—	2,400	C.G.E. Co.	600	.....	600
Perth .....	.....	.....	.....	.....	.....	1,350
.....	.....	.....	.....	.....	Grand Total	521,585

\*Spare transformers included.

Table No. 2

STATION TRANSFORMERS ORDERED FOR MUNICIPALITIES AND COMMISSION  
DURING FISCAL YEAR ENDING OCTOBER 31st, 1918

Station	Cycles	Voltage	Mfr.	No.	Kv-a. each	Total Kv-a.
Niagara Falls Transformer St'n.	25	12,000-26,400	C.W.Co.	3	3,500	10,500*
		12,000- 550	C.W.Co.	3	75	225*
Dundas Transformer Station..	25	63,500-13,200	G.E.Co.	7	2,500	17,500*
	25	13,200- 550	P.E.Co.	3	75	225*
Guelph Transformer Station...	25	63,500-13,200	C.G.E.Co.	4	1,250	5,000*
Essex Transformer Station—						
Can. Salt Co.'s Dist. Station.	25	26,400- 176	M.E.Co.	3	750	2,250
Leamington " " .	25	26,400- 2,300	C.C.W.Co.	3	75	225
Essex " " .	25	26,400- 2,300	M.E.Co.	1	75	75
Harrow " " .	25	26,400- 2,300	M.E.Co.	1	75	75
Amherstburg " " .	25	26,400- 2,300	P.E.Co.	3	100	300
Cottam " " .	25	26,400- 230	M.E.Co.	1	25	25
Canard River " " .	25	26,400- 230	M.E.Co.	1	25	25
Kingsville " " .	25	26,400- 2,300	C.W.Co.	3	75	225*
Big Chute Generating Station..	60	2,300-22,000	C.W..Co.	1	600	600
Collingwood Dist. Station....	60	22,000- 2,300	C.G.E.Co.	3	400	1,200
Midland Municipal Station..	60	22,000- 2,300	C.G.E..Co.	3	300	900
Beeton Dist. Station.....	60	22,000- 4,000	M.E.Co.	1	75	75
Thornton Dist. Station.....	60	22,000- 4,000	M.E.Co.	1	25	25
Tottenham Dist. Station....	60	22,000- 4,000	M.E.Co.	1	75	75
Cookstown " " ....	60	22,000- 4,000	C.G.E.Co.	1	75	75
Bradford " " ....	60	22,000- 575	M.E.Co.	3	100	300
	60	2,300- 575	C.G.E.Co.	3	15	345
Eugenia Falls Generating St'n.	60	4,000-22,000	C.W.Co.	3	900	2,700
St. Lawrence System—						
Brockville Dist. Station.....	60	25,400- 2,400	C.G.E.Co.	2	750	1,500
Cornwall Transformer Station	60	63,500-26,400	C.G.E.Co.	4	1,250	5,000
		26,400- 2,300	C.G.E.Co.	3	100	300
Central Ontario System—						
Fenelon Falls Gen. Station....	60	24,000-44,000	C.G.E.Co.	1	750	750
Wellington Dist. Station....	60	44,000- 4,160	C.G.E.Co.	1	300	300
Picton " " ....	60	44,000- 2,400	C.G.E.Co.	1	300	300
Rideau System—						
Perth Dist. Station .....	60	26,400- 2,300	C.G.E.Co.	3	200	600*
Merrickville Municipal St'n..	60	25,400- 600	C.G.E.Co.	1	750	750*
					Total kv-a	52,145

\*Transformers transferred from other stations.

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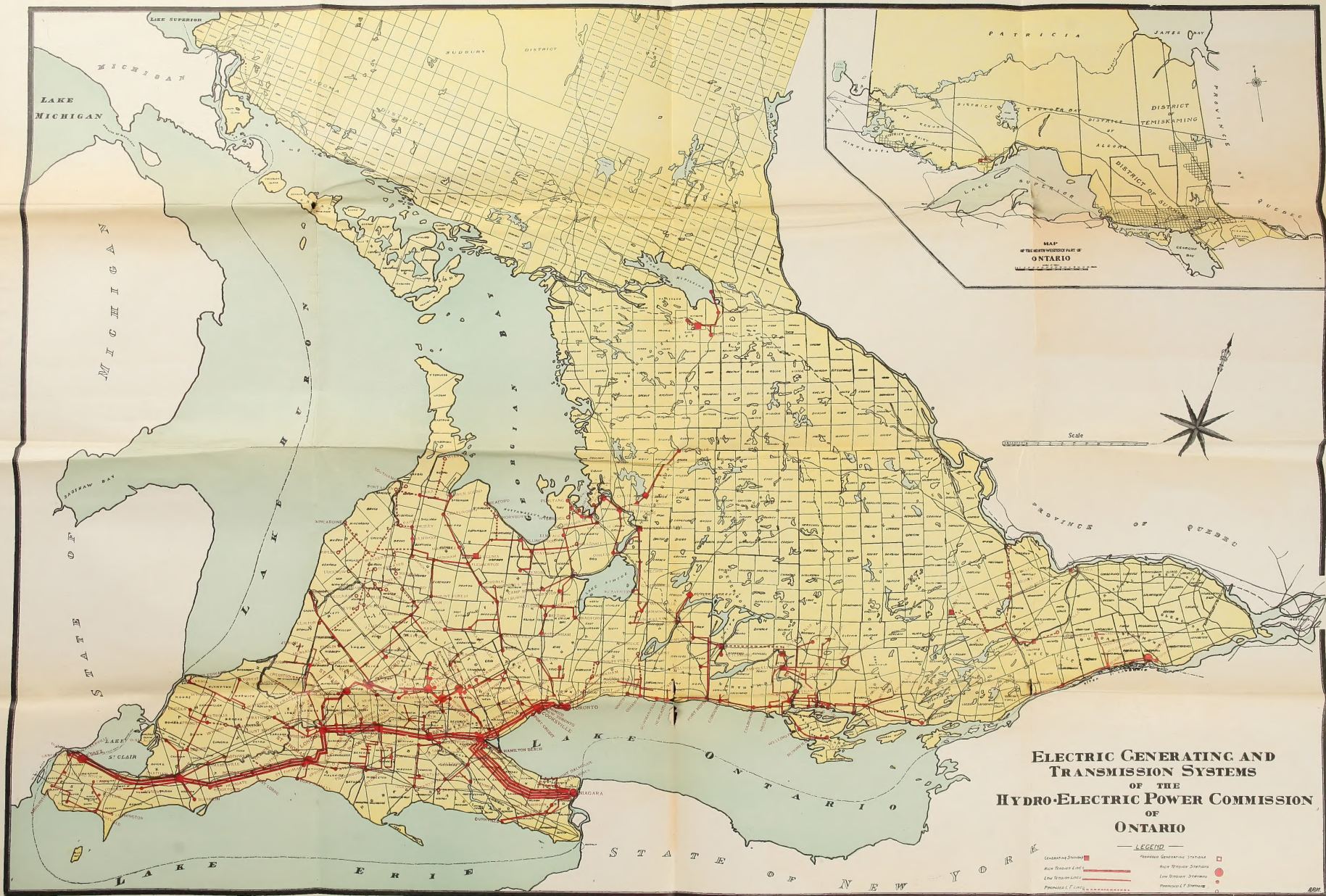














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